EXECUTIVE SUMMARY

This report is submitted under authority of Section 205 of the 1948 Flood Control Act as amended. The report was prepared in response to a letter from the City of St. Maries, Idaho, dated 3 December 1997, requesting assistance in investigating and alleviating existing levee problems. The City of St. Maries lies along the banks of the St. Joe river and relies on an aging earthen levee and wooden floodwall flood control system for flood protection during high water events. This report addresses the need for and desirability of undertaking a plan to update and make repairs to the existing flood control system in St. Maries.

The City of St. Maries is located on the left bank of the St. Joe River just below the confluence of the St. Joe and the St. Maries rivers in Benewah County in northern Idaho. The current City dike system can withstand the 200-year event with an extra two feet available for hydraulic and hydrologic uncertainty. Improvements located in the area protected by this floodwall include 17 commercial/industrial firms. The largest is Potlatch Corporation, which is the largest employer in Benewah County, employing 380 local residents. There are also 56 residential structures in the flood hazard area. The total value of improvements and contents in the threatened area has been estimated to be at least \$53.0 million. In addition, Potlatch has \$13.0 million worth of log, plywood, and lumber inventory stored in the flood hazard area.

Structural and non-structural alternatives were examined to address the objectives of this study. In evaluating these alternatives, legal, financial, policy, social, economic, engineering and environmental criteria were considered as well as public and agency input. Only one alternative was found to warrant detailed investigation in this Corps study: provision for replacing the aging and damaged timber floodwall that is integral to the flood control system with a sheet pile wall. This would provide high quality protection from the 200-year event with an additional 2 feet for uncertainty. This report recommends that the Corps of Engineers construct a new floodwall.

The proposed floodwall would be constructed of driven sheet pile with a concrete cap within the footprint of the existing timber structure. The existing structure is 770 feet long. Bank protection for approximately 600 feet on the river side of the upstream end of the floodwall is also required due to erosion of the slope.

The environmental impact of the project would be minimal, as construction would consist primarily of replacing an existing structure. Construction would take place during low water, minimizing impacts to the river. Plantings would be placed on the river side of the floodwall where little or no vegetation currently exists. Measures would be taken to guard against fuel and oil spills during construction. The proposed project will not negatively impact the city of St. Maries area and its natural resources. The proposed action will comply with all applicable laws, regulations, and agency consultations. It has

been determined that performance of this work, in accordance with the conditions herein described or referenced, is a major federal action that will not significantly affect the quality of the human environment, and thus does not require the preparation of an Environmental Impact Statement. A section 404(b)(1) evaluation has been prepared for the project and determined that the project includes appropriate and practicable steps to minimize adverse impacts to the aquatic ecosystem, and that there is no practicable alternative that would have less impact on the aquatic environment.

The total implementation cost is estimated at $ 1,149,000 (October 2001 price level) The fully funded cost is estimated to be $1,186,000. The local sponsor's share would be $415,100.

Average annual benefits resulting from replacing the timber floodwall total $663,000. The average annual costs would be $76,700, and the Benefit to Cost Ratio (BCR) would be 8.6 to 1.0.

The City of St. Maries would be responsible for operating and maintaining the project. Maintenance requirements consist of annual inspections. Average annual operation and maintenance costs are estimated at $5,000.

ST. MARIES, IDAHO
REPLACE TIMBER FLOODWALL STUDY

DETAILED PROJECT REPORT AND ENVIRONMENTAL ASSESSMENT

TABLE OF CONTENTS

SECTION 1. BACKGROUND

1.01 Authority.

This report is submitted under authority of Section 205 of the 1948 Flood Control Act as amended. The report was prepared in response to a letter from the City of St. Maries, dated 3 December 1997, requesting assistance in investigating and alleviating existing problems with the flood control system. The City of St. Maries lies along the banks of the St. Joe river and relies on an earthen levee and wooden floodwall flood control system for flood protection during high water events. This report address the need for and desirability of undertaking a plan to update and make repairs to the existing flood control system in St. Maries.

1.02 Study Area and History.

The project site is located on the St. Joe River in north central Idaho. The St. Joe River has a total drainage area of 1,886 square miles and is a major tributary to Coeur d' Alene Lake and the Spokane River system. The river flows from the western slopes of the Bitterroot Range on the Idaho/Montana border.

The City of St. Maries is protected from flooding on the St. Joe River by an extensive earthen levee system and a wooden floodwall. The study area for this Detailed Project Report (DPR) and Environmental Assessment (EA) is the approximately 195-acre floodplain that is protected the existing wooden floodwall and levee system. The existing timber floodwall and adjacent earthen levees were constructed by the Corps of Engineers in 1942 under the Flood Control Act of June 28, 1938 (Public Law #761). This project was implemented under a Section 221 agreement signed by the City that gave assurances as required by items (a), (b) and (c) of the 1936 Flood Control Act. The resolution stated “to maintain all the works after completion in accordance with the regulations prescribed by the Secretary of War”. The City has met this obligation over the 59 years since the project was built. The project has exceeded its economic life. For these reasons, there is no remaining obligation on the part of the sponsor to rehabilitate or replace the failing timber crib wall as would be necessary under current requirements. Recent Corps of Engineers inspection reports indicate that the wooden floodwall has exceeded its design life and that many of the timbers are damaged or rotted through, or missing altogether. In addition, the wall seeps during high water events. Appendix A contains the inspection reports. Land use in the flood hazard area is primarily residential, industrial, and commercial. The wooden floodwall is located on property owned by the Potlatch Corporation, which is Benewah County's largest employer. The mill at the project site employs 380 local residents. Sixteen other businesses are located in the hazard area, as are 56 residential structures. Land use is anticipated to remain the same in the foreseeable future.

Based on a request from the City of St. Maries dated 3 December 1997, the Corps initiated the Feasibility Study in 1998 with the City of St. Maries serving as the local sponsor.

Based on requests for assistance from the Governor of Idaho and the City of St. Maries received in February and March 1999, Seattle District Corps of Engineers conducted an investigation and produced an Advance Measure Project Information Report. Emergency construction was subsequently performed to shore up the deteriorated floodwall prior to the 1999 flood season. The emergency repairs consist of driven H-piles on the land side of the floodwall, a continuous steel waler bolted to the H-piles, and wire rope wrapped around the river side timber piles and secured to the H-piles. The design life of the emergency repairs is estimated to be less than five years.

1.03 Existing Flooding Conditions (Without Project).

Currently, the aging wooden floodwall is the weak point in the flood control system that protects the City of St. Maries from inundation. The emergency repairs performed in April 1999 will hold up for several years at best. Overall, the entire structure is irreparably weakened and damaged. Water levels at or above a 13-year event can be expected to cause catastrophic failure of the floodwall. Failure also will eventually occur from sustained moderate water levels, on the order of a two-year event, or from continual raising and lowering of water levels from season to season.

Flooding threats in the St. Joe River valley occur often. Major damage in the valley was caused by a 90-year event in 1996. Minor damage in the valley was experienced from a 20-year event in 1997. In both of these events, the downtown area protected by the floodwall and adjacent city levees was undamaged. Flooding is caused by excessive runoff during the snowmelt season in the western Bitterroot Range. Large events are generally the result of a large snowpack that melts quickly with warm temperatures and/or heavy warm rain at high elevations.

The existing city flood control system, with the notable exception of the wooden floodwall, can withstand a water surface elevation of 2144’ (at the AVISTA gage site). This is approximately equivalent to a 200-year event.

1.04 Needs.

The primary need for the community in St. Maries is the continuing integrity of their vital flood protection system.

1.05 Other Studies and Reports.

Preliminary Examination and Partial Survey of Spokane River and Tributaries, Idaho, USACE, April 1938.

Advance Measures Project Information Report, St. Maries Idaho, USACE, March 1999.

SECTION 2. PLANNING OBJECTIVES AND CRITERIA

2.01 Planning Objectives.

For this study, the planning objective is to determine the best course of action to mitigate the flood threat caused by the aging and damaged wooden floodwall in St. Maries.

2.02 Planning Criteria.

a. General.
To meet the planning objective, a wide range of criteria were considered. These planning criteria were used to screen and evaluate alternative plans and to measure each plan's contribution to the National Economic Development (NED), Environmental Quality (EQ), Regional Development (RD), and Other Social Effects (OSE) of the Water Resources Council's Principles and Guidelines. The criteria considered include identified outputs, factors, and conditions that impose constraints and limitations on the planning process and rules and guidelines for evaluation of the plans. The criteria also include other needs, opportunities, and concerns in addition to the primary planning objective. Not all the criteria are compatible, and no plan could fully satisfy all of them. Applicable planning criteria for the study are presented in the following paragraphs under the account to which they are primarily related.

b. National Economic Development Criteria.
The NED criteria are used to guide the formulation of alternative plans to meet the objective of developing maximum net benefits to the nation. The pertinent NED criteria used in these studies include the following:

- Mitigate the flood threat resulting from the damaged condition of the wooden floodwall.
- Use the Congressionally mandated Federal interest rate to determine annual costs and discount future benefits (currently 6-5/8 percent).
- Use a 50-year project economic life to evaluate flood damage reduction plans.
- Include, in the calculation of average annual costs, interest and amortization of construction costs and provision for annual maintenance, operation, and major replacement.
- Measure economic efficiency of alternative plans by net benefits. Total annual benefits minus total annual costs equals net benefits.
- Maximize net benefits.

- Each plan must be complete within itself and include all actions necessary to realize its economic benefits.

- Each plan should be stable as related to economic conditions and realize its economic benefits under a range of reasonable future economic conditions.

c. Environmental Quality Criteria.
The EQ criteria that follow consist of specific environmental resources related constraints and opportunities applied to each alternative to maximize contribution to the environmental quality objective. These can include criteria imposed by Federal, state and local regulation and those uniquely related to the St. Joe valley. The environmental resources of the study area are described in Paragraph 4.06. The EQ criteria used in this study are as follows:

- Preserve water quality in the St. Joe River.
- Minimize any impacts to Endangered or Threatened Species.
- Preserve aesthetic values within the study area.

Potential problems with meeting EQ criteria are minimized because alternatives are limited to replacing the existing structure. The EA (see Paragraph 5.06) discusses the above-mentioned environmental criteria and the potential effects of the recommended plan.

d. Regional Development Criteria.
The following RD criteria include opportunities related to increased economic efficiency within the study area (or region), but do not necessarily benefit the nation as a whole.

- Mitigate the flood hazard resulting from the aging and damaged floodwall and aid the community in improving the outlook for future economic development. The floodwall is located adjacent to the property of the largest employer in Benewah County.

- Contribute to overall community development by a reduction of the depressing economic effects of flood damages to the extent practical within the study area.

e. Other Social Effects Criteria.
The OSE criteria listed below include those engineering policy standards that are applied to all alternatives to assure the maintenance of public health and safety and those opportunities and constraints related to social well being of people.

- Enhance the quality of life in the study area by reducing the fear of flooding for those in the flood hazard area and reducing the risk of injury due to floods.

- Avoid the relocation of public facilities and properties and the resulting inconvenience to residents during construction.

f. Local Acceptability Criteria.

The following criteria are specific to the affected area and were used to determine each alternative's acceptability to the city of St. Maries.

- Maintain existing level of flood protection.
- Maintain Potlatch's access to the mill site.

The project alternatives that were considered address the RD and other OSE criteria listed above.

SECTION 3. FORMULATION AND EVALUATION OF ALTERNATIVES

3.01 Plan Formulation Approach.

The plan formulation process begins with the identification of the planning objective and the planning criteria. During this preliminary phase, structural and non-structural alternatives are identified that address the planning objective while considering the planning criteria. The wishes of the local sponsor are also considered in developing potential measures.

3.02 Study Results.

Non-structural alternatives, such as relocations and floodproofing, were quickly dismissed. A significant portion of the city of St. Maries and its industrial heart are located in the flood hazard area. Non-structural alternatives would be both cost-prohibitive and devastating to the community.

a. Replacement of Timber Floodwall.
The Corps determined that replacing the existing wooden floodwall with a new floodwall was the only practicable alternative to meet the project objective. Flood protection for the community of St. Maries is dependent upon maintaining the integrity of the entire city system. In addition, the floodwall is located in the economic and industrial center of St. Maries and flooding would have severe economic impacts.

b. Bank Protection.
Bank protection along the majority of the floodwall location is needed. Bank protection will also be used on the upstream and downstream ends where the floodwall ties in with the existing levees.

3.03 Feasibility Plan Formulation.

Only construction alternatives that the Corps determined to be feasible from a social, economic, engineering, and environmental standpoint were studied in the feasibility study. The alternative's contributions to the NED, EQ, RD and OSE accounts of the Water Resources Council's Principles and Guidelines were then evaluated and the recommended plan was selected.

Besides the no-action (without-project) alternative, which is always considered, replacing the existing structure with an earthen levee was evaluated, as were design variations for replacing the existing wall with a new floodwall.

3.04 Description of Alternatives

3.04.a No-Action (Without-Project) Alternative.

No action by the Corps of Engineers would be taken for mitigation of the flood hazard produced by the aging and damaged floodwall through either structural or non-structural means. The no-action alternative would result in the eventual complete failure of the floodwall. Water levels at or above a 13-year event can be expected to cause catastrophic failure of the floodwall. Failure also will eventually occur from sustained moderate water levels, on the order of a two-year event, or from continual raising and lowering of water levels from season to season. It is unknown whether the failure would be sudden and catastrophic, or gradual. Regardless of the failure type, the resulting damages would be economically devastating to the community. The local sponsor lacks the means to prevent this failure under the Federal No-Action Alternative.

3.04.b. Sheet Pile Wall With Concrete Cap Alternative- Recommended Plan

Replacing the existing wooden floodwall with a driven sheet pile wall and concrete cap is the recommended option. The new floodwall would be built within the footprint of the existing structure, minimizing real estate and environmental impacts. The wall would be built to the same level of flood protection as the rest of the existing flood control system.

3.04.c. Concrete Wall Alternative.

This alternative would provide a replacement floodwall in the existing footprint. The level of flood protection would be the same as the sheet pile wall alternative. The benefits, therefore, would be the same as the sheet pile wall alternative, but the initial costs would be slightly higher, at $1,211,000. Annual maintenance costs would be the same as the sheet pile alternative. This alternative was rejected because the recommended alternative provides the same benefits at a lower cost.

3.04.d. Earthen Levee Alternative.

This alternative would provide an earthen levee section in place of the existing wooden floodwall. Flood protection and therefore benefits would be the same as the floodwall options described above. The construction and maintenance costs would be significantly lower. However, this option was removed from further consideration because it will not fit in the footprint of the existing structure. Moving construction outside of the existing project footprint is not an option because of space limitations on Potlatch property on the landward side. The existing structure is immediately adjacent to the access road and the mill building, and expanding the footprint would impair access and/or require relocation of mill facilities. This is unacceptable to Potlatch and the city of St. Maries. Moving riverward would cause an increase in the water surface profile and have adverse environmental impacts. A cost estimate was not prepared for this alternative.

3.04.e Timber Crib Wall Alternative.

This alternative would provide a new double-wall floodwall similar to the existing structure. Flood protection, benefits and annual costs would be the same as the sheet pile alternative. This alternative was removed from further consideration because of the difficulty and environmental issues associated with obtaining timbers to construct the wall and treating them in order to prevent deterioration. A cost estimate was not prepared for this alternative.

3.04.f. Expand Existing Advance Measures Repair

This option would add on to the existing H-pile shoring that was driven on the land side of the crib wall under PL 84-99 Advance Measures in February 1999. H-piles would be driven on the river side and the wall would be shored up using steel walers and wire ropes. This option was eliminated because it would not provide long-term protection, nor does it solve the problem of the rotting and broken timbers. A cost estimate was not prepared for this alternative.

3.05 Selection of Recommended Plan.

The results of feasibility planning indicate that only one alternative, the driven sheet pile floodwall with concrete cap, met the requirements of economic, engineering, and environmental feasibility while responding to the planning criteria and the sponsor's and community's needs to the greatest extent possible.

SECTION 4. THE RECOMMENDED PLAN

4.01 General.

The deteriorating wooden floodwall portion of the existing flood control system at St. Maries does not currently provide adequate flood protection. The floodwall and earthen levee system was designed to provide 200-year protection. Currently the system is providing less than 13-year protection. Engineering analyses used in developing the project design included determination of floodwall design height, geotechnical conditions, and hydraulic analyses. Design features and pertinent analyses are discussed in the following paragraphs.

4.02 Foundation Conditions.

Limited exploration was performed for the original wall construction in about 1939 or 1940. The method of exploration is undetermined and the soil property descriptions are very limited. Based on these borings and observations made during the driving of H-piles for the Advance Measures project constructed in 1999 a preliminary description of the foundation conditions has been formulated. The earth fill within the crib wall appears to consist predominantly of fine-grained sands and silts. Soils from ground surface to about 4 to 6 feet below ground surface consist of soft to very soft sands, silty sands, and sandy silts with varying organic content. These soils overlay a deposit of loose sands and soft clays and sandy clays. Below these soft and loose soils the material starts to develop more strength as evidenced by the increasing driving resistance to the above referenced H-pile installations.

A detailed Geotechnical investigation and analysis will be performed during the plans and specifications phase of this study.

4.03 Design Features.

a. Hydrologic Analysis.

The subject floodwall and adjacent levees were constructed by the Corps of Engineers in 1942 to a consistent elevation of 2146 ft. (AVISTA). The floodwall and levees were designed and constructed to provide protection from flood hazards to the city of St. Maries by means of a continuous flood control system. The floodwall is located 1.5 miles downstream from a stage recording gage that is operated by AVISTA (formerly Washington Water Power).

To assess the current level of protection, a revised stage-frequency curve was developed to include all of AVISTA’s gage data through 1998. It was found that this updated curve did not differ significantly from the previous curve constructed in 1988. The updated curve is provided in Appendix A. A mixed population analysis was performed in order to account for the differing flood types caused by either rainfall or snowmelt in the basin.

b. Hydraulic Analysis.

A HEC-RAS model was used in order to account for the slight decrease in water surface elevation between the AVISTA gage and the floodwall. The 10-year event, the 50-year event, and the 100-year event were all analyzed. A plot of water surface profiles is provided in Appendix A. The hydraulic modeling results are summarized below:

Table 4.1: HEC-RAS model results accounting for drop in water surface elevation between the gage location and the flood wall location

	Stage at gage location (AVISTA)	Stage at flood wall (AVISTA)	Water height on flood wall (ft)	Flow in River (cfs)
10-year event	2137.7	2137.5	3.5	34,200
50-year event	2140.9	2140.4	6.4	62,600
100-year event	2142.3	2141.7	7.7	80,800
200-year event	2144.2	2143.5	9.5	108,000

The St. Joe flood wall was previously the subject of an Advance Measures report dated 25 March 1999. At that time, the emergency nature of the situation only allowed for a rudimentary analysis of the failure point of the floodwall. For the purpose of the Advance Measures project the difference in water surface elevation between the gage and the flood wall was assumed to be negligible, and the failure event was estimated to occur at a stage of 2138.2' at the floodwall, which is an 11-year event. Based on further analysis performed for the Section 205 project, it is now estimated that this would be closer to a 13-year event. It is favorable that this difference is very minor, as it validates the results used to justify the earlier Advance Measures project.

An inundation area map provided by the city of St. Maries (developed by Welch, Comer and Associates) was used for this analysis. It is an accurate representation of the extent of flooding that would occur if the floodwall failed. This inundation area map is provided in Appendix A.

c. Floodwall Design.

The recommended solution is to construct a new floodwall to the same design elevation as the rest of the system. Plate 1 shows the location plan and Plate 2 shows a cross-section of the proposed project. The left bank of the St. Joe River in the vicinity of St. Maries is built to a constant elevation of 2146' (AVISTA) in order to provide continuous protection to the city. If built to the same elevation as the currently deteriorating floodwall and the rest of the levees, the reconstructed wall would provide St. Maries with the level of protection originally intended. With a top elevation of 2146' (AVISTA), it would afford protection from the 200-year event with an additional two feet available for hydrologic and hydraulic uncertainty. The stage-frequency diagram is provided in Appendix A. It is sensible to recommend a top elevation of 2146' in this feasibility report, as it would serve to restore the protection provided by the original continuous system. During the feasibility phase, USACE guidance (EC 1105-2-211) includes identifying and recommending "the best solution for the identified problem generally in accordance with the procedures applicable to specifically authorized studies, limited by the scope and complexity of the recommended solution." In the case of replacing the deteriorating floodwall with a new one, the recommended solution is relatively simple and narrow in scope. The level of analysis is appropriate, as USACE guidance states that "the level of detail should be minimized to that which is necessary to determine the recommended plan."

Construction of the recommended plan may have impacts on a small office building owned by Potlatch, located on the river side of the floodwall near the downstream end of the structure. Access to the building may be disrupted during the construction period. In addition, there are power lines, water supply lines, fire water lines, and telephone cables that will need to be relocated. It will be necessary to coordinate construction with the Potlatch Corporation.

d. Geotechnical Analysis.

Geotechnical analysis. Based on the boring logs described in paragraph 4.02, Foundation Conditions, the following soil parameters were used for preliminary design:

Moist unit weight = 120 Pounds per cubic foot (PCF)
Total weight of one cubic foot of soil including water in voids

Angle of internal friction for Sands and Silty Sands= 30 degrees
A measure of friction strength. It is the angle that a specimen will rupture under a controlled test

Void ratio = 30%
Volume of gas and water divided by the volume of solids in a soil specimen. Note: gas is usually air

Active earth pressure coefficient (Ka) = 0.33
A coefficient of the lateral pressures developed against structures by the weight of the soil and dead and live loads

Cohesion for Clays and Sandy Clays= 250 to 350 Pounds per square foot (PSF)
A measure of soil strength. Bonding between surfaces of colloidal particles resulting from electrochemical or other forces

e. Bank Protection.

A visual inspection of the riverward bank along the length of the existing crib wall found that the bank is being eroded. On average, the erosion consists of a five foot high, near vertical cut. This erosion has reduced the riparian corridor between the existing crib wall and the river to a width of between five and fifteen feet. This riparian corridor should be protected and it is recommended that rip rap be placed along this cut bank to arrest the on-going erosion. If erosion is allowed to continue, it will threaten the floodwall. The rip rap should be placed on a 2H:1V (two horizontal to one vertical) slope with a five-foot wide top width. A three-foot deep buried toe should also be used in this design. The bank protection design is shown on Plate 3. To mitigate for habitat impact, incorporation of root wads angled roughly 45 degrees upstream should be incorporated into this bank protection spaced on 40 to 50 foot centers.

f. Environmental Mitigation.
Environmental mitigation will be needed to a limited degree for the riprap bank protection. The extent of mitigation needed will be determined through research and coordination with appropriate agencies. As noted above, large woody debris (LWD) will be incorporated into the bank protection design to minimize the impact of rip rap bank protection. Native plants will be planted in areas where it is necessary to remove existing vegetation.

4.04 Real Estate.

The total project area needed for construction includes approximately 2.97 acres of land. The proposed flood control features fall within the footprint of an existing federally assisted project constructed in 1939 by the Government involving approximately .40 of an acre. The city of St. Maries, Idaho, non-Federal Sponsor owns fee interest in this area with a right for access to the project site.

For project construction, the non-Federal Sponsor will need to acquire 0.50 of an acre for a temporary work area adjacent to the project footprint and as shown on Exhibit A. The non-Federal Sponsor will also make available 2.07 acres of City lands as a temporary disposal site for the treated timbers (creosote and pentachlorophenol) not considered hazardous waste. Both temporary work area easements are needed for approximately one (1) year to cover the period of construction. The estimated value for the one-year easements is $3,000. Since the project footprint area and access is within the 1939 project footprint, and previously provided as an item of cooperation for the original flood control project, the non-Federal sponsor is not entitled to credit for this portion of the project footprint. The non-Federal Sponsor is entitled to credit for the temporary work areas.

The District proposes to use the standard temporary work area easement estate language contained in ER 405-1-12, Change 7, dated 8 February 79 for the two temporary work area easements.

The river is considered navigable in this portion of the St. Joe River.

There are no existing federally owned lands with the project area.

There are no relocation assistance benefits anticipated in accordance with Public Law 91-646.

The construction impacts to the small office building owned by Potlatch, located on the river side of the floodwall near the downstream end of the structure, or impacts to the power lines, water supply lines, fire water lines, and telephone cables, are not considered project relocations costs. Nor are relocation costs included in the real estate costs. This is because the non-Federal Sponsor (City of St. Maries) granted St. Maries Lumber Company the right to construct these facilities in May 1951 after the original project was constructed and turned over to the non-Federal Sponsor in 1941 for operation and maintenance. When the non-Federal Sponsor granted St. Maries Lumber Company the right to construct these facilities it was stipulated in the easement that the facilities could not interfere with the non-Federal Sponsor's right to maintain the flood control project. It further stipulated that the use of said land and appurtenances must comply with all regulations and specifications of the United States Army engineers in connection with the flood control project. Further the non-Federal Sponsor is responsible to assure that encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning. Any encroachments such as the GTE line are not viewed as relocation or project related cost.

At this time the District is not aware of any outstanding mineral interests in the vicinity of the project that may affect implementation of the project.

See Exhibit B for an assessment of the non-Federal Sponsor's legal and professional capability, and experience to acquire and provide all the necessary lands, easements, and rights-of-way for construction, operation and maintenance.

The land in the project is not known or suspected to contain hazardous and/or toxic wastes. The treated timbers (creosote and pentachlorophenol) are not hazardous waste. See discussion in paragraph 4.06b(4) of the report.

In accordance with Article III a. of the Project Cooperation Agreement (PCA), the Corps Real Estate Division will provide the non-Federal Sponsor with the project right-of-way requirements and instructions to acquire all the necessary lands, easements, and rights-of-way. The non-Federal Sponsor will also receive copies of Certification of Lands and Authorization for Entry, and Attorney's Certificate of Authority documents for execution similar to Exhibit C.

The non-Federal Sponsor will need to prepare the mapping and legal description for the temporary work areas, obtain title evidence, appraisal, conduct negotiations, and obtain temporary work area easement deed the area not currently owned by the City. This effort involves approximately 8-12 weeks.

The Corps Real Estate Division will review the non-Federal Sponsor's right-of-way document for sufficiency of area and interest before notifying the district that the non-Federal Sponsor's lands are available for advertising.

See Table 4-2 below for the real estate cost estimate for this proposed project. The cost estimate includes an estimated fair market value of the creditable project lands; non-Federal Sponsor's acquisition costs, (incidental acquisition costs, such as title, survey, appraisal, negotiations, legal fees, etc.); Federal review and assistance costs (e.g. providing non-Federal Sponsor with LER requirements, review of acquisition documents, coordination meetings, review of right-of-way documents, legal support, crediting activities, etc).

Table 4-2

Feature Code 01 Lands and Damages

Lands and Damages	$ 3,000	
Non-Federal Sponsor's Costs	$ 4,000	
Federal Review and Assistance Costs		$13,000
Subtotal	$20,000	
TOTAL including 15% contingency	$23,000	

EXHIBIT A

REAL ESTATE MAP

EXHIBIT B

ST. MARIES, IDAHO, SEC 205 FLOOD CONTROL PROJECT

ASSESSMENT OF NON-FEDERAL SPONSOR'S

REAL ESTATE ACQUISITION CAPABILITY

I. **Legal Authority:**

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **Yes.**

b. Does the sponsor have the power of eminent domain for this project? **Yes.**

c. Does the sponsor have "quick-take" authority for this project? **No.**

d. Are any of the lands /interests in land required for the project located outside the sponsor's political boundary? **No.**

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **No.**

II. **Human Resource Requirements:**

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including PL 91-646, as amended? **No.**

b. If the answer to II.a is “yes," has a reasonable plan been developed to provide such training? **N/A.**

c. Does the sponsor’s in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **Yes.**

d. Is the sponsor’s projected in-house staff level sufficient considering its other work load, if any, and the project schedule? **Yes.**

e. Can the sponsor obtain contractor support, if required, in a timely fashion? **Yes.**

f. Will the sponsor likely request USACE assistance in acquiring real estate? **No.**

III. **Other Project Variables:**

a. Will the sponsor's staff be located within reasonable proximity to the project site? **Yes.**

b. Has the sponsor approved the project/real estate schedule/milestones? **No.**

IV. **Overall Assessment:**

a. Has the sponsor performed satisfactorily on other USACE projects? **Yes.**

b. With regard to this project, the sponsor is anticipated to be:

___ highly capable
___ fully capable
_**X**_ moderately capable
___ marginally capable
___ insufficiently capable. (If sponsor is believed to be "insufficiently capable:, provide explanation).

V. **Coordination:**

a. Has this assessment been coordinated with the sponsor? **Yes.**

b. Does the sponsor concur with this assessment? **Yes.**

Prepared by:

-----------signed------------------10/7/99
Wanda F. Gentry DATE
Realty Specialist

Reviewed and approved by:

------------signed-------------------10/7/99
Joseph C. Duncan DATE
Chief, Real Estate Division

EXHIBIT C

DATE

Department of the Army
Seattle District, Corps of Engineers
ATTN: Real Estate Division
Post Office Box 3755
Seattle, Washington 98124-3755

RE Certification of Lands and Authorization for Entry the St. Maries, Idaho, Section 205 Repair of Floodwall

Dear Sir:

By Project Cooperation Agreement dated the ______ day of ______________________ 2000, the City of St. Maries Idaho, assumed full responsibility to fulfill the requirements of non-federal cooperation as specified therein and in accordance with the Water Resources Development Act of 1986, as amended.

This is to certify that the City of St. Maries has sufficient title and interest in the lands hereinafter shown on Exhibit A, attached, in order to enable the City of St. Maries to comply with the aforesaid requirements of non-federal cooperation.

Said lands and/or interest therein are owned or have been acquired by the City of St. Maries and are to be used for the construction, maintenance and operation of the above referenced project and include but are not limited to the following specifically enumerated rights and uses, except as hereinafter noted:

1. Perpetual Flood Protection Easement. A perpetual and assignable right and easement in the land delineated on Exhibit A attached to construct, maintain, repair, operate, patrol, and replace a flood protection levee, including all appurtenances thereto; reserving, however, to the owners, their heirs and assigns, all such rights and privileges in the land as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

2. Temporary Work Area Easement. A temporary easement and right-of-way in, on, over, and across (the land delineated on Exhibit ___ attached for a period not to exceed one (1) year, beginning _________ and ending ________________, for use by the United States, its representatives, agents, and contractors as a work area, including the right to deposit fill, dredge material, and waste material thereon, move, store, and remove

equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the St. Maries Section 205 Repair of Floodwall Project, together with the right to trim, cut, fell, and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject however, to existing easements for public roads and highways, public utilities, railroads, and pipelines.

The City of St. Maries does hereby grant to the United States of America, its representatives, agents and contractors, an irrevocable right, privilege and permission to enter upon the lands hereinbefore mentioned for the purpose of prosecuting the project.

The City of St. Maries certifies to the United States of America that any lands acquired subsequent to the execution of the Project Cooperation Agreement that are necessary for this project have been accomplished in compliance with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (Public Law 91-646) as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR, Part 24.

ST. MARIES, IDAHO

By ___________________________
ERNIE PENDELL
MAYOR

DATE ________________________

ATTORNEY'S CERTIFICATE

I, Nancy Wolff, an attorney admitted to practice law in the State of Idaho, certify that:

I am the attorney for the City of St. Maries, Idaho.

I have examined the title to ______________________________[Parcel #] of land identified by the U.S. Army Corps of Engineers as needed for the St. Maries, Idaho, Section 205 Repair of Floodwall Project, and included in the Certification of Lands and Authorization For Entry document to which this Certificate is appended.

The City of St. Maries is vested with sufficient title and interest in the described lands required by the United States of America to support the construction, operation, and maintenance of the Section 205 Repair of Floodwall Project.

There are no outstanding third party interests of record that could defeat or impair the title and interests of the City of St. Maries in and to the lands described, or interfere with construction, operation, and maintenance of the Project. Such interests include, but are not limited to, public roads and highways, public utilities, railroads, pipelines, other public and private rights of way, liens and judgments. To the extent such interests existed prior to acquisition of the described lands by the City of St. Maries such interests have either been cleared or subordinated to the title and interests so acquired.

The City of St. Maries has authority to grant the Certification of Lands and Authorization For Entry to which this Certificate is appended; that said Certification of Lands and authorization for entry is executed by the proper duly authorized authority; and that the authorization for entry is in sufficient form to grant the authorization therein stated.

DATED AND SIGNED at ______________________________, this ____ day of __________ 2000.

____

NANCY WOLFF
Attorney

SECTION 5.0 ENVIRONMENTAL ASSESSMENT

5.01 General overview

Planning for this proposed action includes a description of the environmental resources of the project area and potential impacts to them. Consideration for the environment includes information necessary to fulfill the requirements of the National Environmental Policy Act (NEPA) and other regulatory requirements.

Environmental planning associated with the St. Maries section 205 flood control project has focused from the outset on avoiding, reducing, or eliminating impacts to riparian habitat. Project alignment and features have been configured to achieve this goal in accordance with recommendations from coordinating agencies. Under the preferred alternative the environmental impact of the project would be minimal, as construction would consist primarily of replacing an existing structure. Construction would take place during low water, minimizing impacts to the river. Plantings would be placed on the riverside of the floodwall where little or no vegetation currently exists. Measures would be taken to guard against fuel and oil spills during construction.

5.02 Need for action

The primary need for the community of St. Maries is flood protection adequate to a 200-year event. The city of St. Maries is protected from flooding on the St. Joe River by an extensive earthen levee system and a wooden floodwall. Flood protection for the community of St. Maries is dependent upon maintaining the integrity of the entire city system. The deteriorating wooden floodwall portion of the existing flood control system at St. Maries does not currently provide adequate flood protection. Currently, water levels at or above a 13-year event can be expected to cause catastrophic failure of the floodwall. Failure also will eventually occur from sustained moderate water levels, on the order of a two-year event, or from continual raising and lowering of water levels from season to season. It is unknown whether the failure would be sudden and catastrophic, or gradual. Regardless of the failure type, the resulting damages would be economically devastating to the community.

5.03 Purpose

The project purpose is to provide the community of St. Maries with flood protection, while meeting required criteria for NED, environmental quality, regional development, and other social effects.

5.04 Alternatives

a. Alternatives considered but rejected

(1) Relocation

A significant portion of the city of St. Maries and its industrial heart are located in the flood hazard area. Relocation would be both cost-prohibitive and economically devastating to the community. The cost of relocation would greatly exceed that of the selected alternative, and would produce an unfavorable benefit to cost ratio.

(2) Floodproofing

A significant portion of the city of St. Maries and its industrial heart are located in the flood hazard area. Floodproofing would be both cost-prohibitive and economically devastating to the community.

b. Reasonable alternatives

No action alternative.

The no-action option would result in the eventual complete failure of the floodwall. Failure will eventually occur from sustained moderate water levels, on the order of a two-year event, or from continual raising and lowering of water levels from season to season. Furthermore, water levels at or above a 13-year event can be expected to cause catastrophic failure of the floodwall. The local sponsor and other agencies lack the means to prevent this failure under the federal no-action alternative.

An action alternative would consist of two parts: (1) stabilization of bank and (2) replacement of floodwall. Several alternatives were developed for each part.

(1) Bank stabilization alternatives

Bio-engineered bank protection alternatives

The project condition requires that some form of immediate bank protection is necessary. The following section discusses the potential to use bioengineered vegetated bank protection in lieu of riprap

Shear stress, or tractive force, is a hydraulic parameter that correlates fairly well with erosion potential. For practical applications, bank shear is assumed to equal bed shear at the toe of slope, and vary linearly with depth up the streambank

The applicability of alternative bank treatments is based upon estimates of each alternative’s ability to withstand hydraulic shear. Hydraulic shear is greatest during flood events.

On most river systems, designers are usually concerned with how shear varies with depth throughout the cross section. Bank shear is considered highest at the toe of slope, and decreases linearly with flow depth. Thus, riprap is typically used at the toe of slope where shear is highest and less intensive treatments may be used higher up the bank as shear decreases with flow depth. Under proposed conditions, the linear reduction of shear with respect to flow depth must be considered along with the longitudinal variation of shear. The variation of shear with respect to channel station through the project reach is highly significant. The applicability of vegetative treatments along channel banks must consider shear variations as a function of depth and local hydraulics introduced from the drop structures.

The Corps initially compared the expected performance, failure potential, operation and maintenance requirements, anticipated benefits, and typical costs of five bioengineered alternatives for bank protection through the project reach. The five alternatives evaluated include: 1) live stakes including live fascine bundles or wattles, 2) brush mattresses, 3) vegetated geogrids, 4) biodegradable reinforcement (fabric wrapped soil), and 5) non-biodegradable reinforcement (turf reinforcement geotextile mats).

Applicability of alternative bank treatments is approached from an allowable shear basis. It should be noted, however, that allowable shear values obtained from various studies might not necessarily be applicable for St. Joe River. Shear values quoted from studies may have withstood the quoted shear value for significantly less time than flow duration's occurring in St. Joe River. Shear values based on professional judgement should be considered relatively conservative estimates.

Live stakes

Live stakes include vegetative cuttings that are collected from donor plants between late fall after leaf drop and early spring before leaf out. Cuttings are typically native willow, dogwood or cottonwood species, and should be collected locally. The cuttings may be placed individually or tied into bundles to form fascines or wattles. Fascines are placed horizontally in shallow ditches in the streambank, and usually parallel with flow. Wattles are a bundle of cuttings that are driven or otherwise placed into the streambank. Live stakes are an excellent form of erosion control once cuttings have established into a dense stand of riparian vegetation. A dense stand of riparian vegetation will reduce flow velocities along channel banks, and root masses provide soil reinforcement of the streambank by physically binding soil particles. A dense and mature stand of riparian vegetation may withstand shear of 2-3 psf.

The primary drawback of live stake bank protection is that erosion protection may not be adequate during the vegetative establishment period. The establishment period varies depending on planting densities, and availability of light, water and nutrients, climate and other factors. Under optimal conditions, the establishment period is likely 3 to 5 years. Live stakes do not provide sufficient root masses to reinforce soils during their establishment period. Their placement on bare soils can even induce local hydraulics that may exacerbate erosive conditions. A short-term estimate of allowable shear for live stakes should be based upon streambank soils' ability to withstand hydraulic shear. Using Shields (1936) equation and assuming a stable particle diameter of ¼ inch (6 mm), allowable short-term shear for live stakes is estimated at 0.1 psf. A non-woven coconut fiber (coir) fabric may increase the short-term allowable shear to 0.3 psf.

Although moisture conditions near St. Maries are usually sufficient to allow for vegetative establishment, temporary irrigation should allow for a higher survival rate for vegetative plantings. Such irrigation should occur during the months of June through September, for 3 to 4 years. Temporary irrigation could be applied by a drip system or truck mounted spraying. If there is existing water right at the dam, irrigation water could potentially be supplied from St. Maries River. Maintenance may also require repair to areas that may become damaged during the establishment period.

A benefit of using live stake bank protection is that this approach will eventually provide shade and overhanging cover to the stream channel. It is also relatively inexpensive. A live stake installation may typically cost $4.00 per square foot of bank treated.

Brush mattresses
Brush mattresses are similar to live stakes in that they will develop a dense stand of riparian vegetation highly resistant to erosional forces associated with flowing water. Brush mattresses are planted much more densely than live stakes. Thus, the establishment period to provide adequate protection may be shorter (approx. 2 to 4 years) than that of live stakes. Brush mattresses are comprised of native riparian cuttings that are laid side by side along the stream bank. The thicker, basal end of the cutting is placed within the low flow water surface to assure proper moisture conditions. After the cuttings are placed, a thin layer of soil is placed over the cuttings and the brush mattress is cabled and staked in place. Brush mattresses may withstand hydraulic shear of 4.0 psf to 4.6 psf (Florineth, 1982) and 6.5 psf (Florineth, 1995.) Short-term allowable shear is expected to be similar to that of live stakes.

As with live stakes, brush mattresses may be susceptible to damage during their establishment period. However, because brush mattresses form a relatively complete coverage of the underlying soil surface, there is less localized scour compared to that associated with live stakes during the establishment period. Depending on the site, it is possible that backfilled soils will either be lost during high flows (desiccating willows) or that accretion of additional soils may occur due to the local roughness of the treatment. If surficial erosion were observed immediately after its occurrence, soil could be placed back on top of the cuttings and desiccation might be avoided. If erosion occurred beneath the brush mattress, the damaged area would have to be repaired. A benefit of this alternative is that it does not require temporary irrigation if the basal ends of cuttings are placed below the summer low flow elevation. This alternative will also provide the benefit of eventually providing shade and overhanging cover to the stream channel. Typical cost associated with installing brush mattresses is approximately $8 per square foot of bank treated.

Vegetated geogrids
A vegetated geogrid would consist of soil placed in 1 to 1.5 foot lifts and wrapped in a non-woven biodegradable fabric and a synthetic geogrid material. The non-woven biodegradable fabric resists piping loss during the vegetative establishment period, while the geogrid material provides structure to the soil lift and holds the biodegradable fabric in

place during the vegetative establishment period. After vegetation has become established (approx. 3 to 5 years), the geogrid material provides permanent reinforcement to the soil/root mass matrix. Vegetation would consist of a native riparian grass seed mix placed beneath the nonwoven biodegradable fabric and cuttings placed between or into the fabric-reinforced soil lifts. This configuration may withstand 2.0 psf hydraulic shear during the vegetative establishment period and should provide protection up to 6.0 psf following the vegetative establishment period.

This alternative provides the benefit of a relatively high allowable shear during the vegetative establishment period. It does, however, have a stringent maintenance requirement, and considerable attention to detail during construction. Woody vegetation should not be allowed to grow beyond 4 to 6 inches diameter breast height (dbh.) If vegetation is allowed to mature beyond 6 inches dbh, it may eventually fall into the channel. A mature tree falling, with its roots intertwined in geogrid, will likely pull the geogrid material with it and unravel the streambank. This maintenance requirement reduces the potential for overhanging cover and shade. This alternative may also require temporary irrigation as described in the live stakes alternative. Typical cost for this alternative is approximately $13 per square foot of treatment.

Biodegradable reinforcement
Biodegradable reinforcement is identical to the vegetated geogrid alternative, with the exception that an organic woven coir fabric is used in lieu of a synthetic geogrid. Thus, the woven coir fabric provides structure to the soil lifts and holds the nonwoven fabric in place during the vegetative establishment period. Within 3 to 5 years the fabric will biodegrade and vegetation then provides structure to streambank soils. This configuration will withstand 1.0 psf hydraulic shear during the vegetative establishment period and up to 6.0 psf following the vegetative establishment period.

Biodegradable reinforcement may require temporary irrigation for approximately 3 years, as described for the live stakes alternative. This alternative provides the benefit of an increased allowable shear during the vegetative establishment period as compared to live stakes and brush mattresses. In addition, if wooden stakes are used to secure fabric, all materials are organic and will biodegrade. It will also provide shade and overhanging cover to cherry creek as vegetation matures. Typical cost for this alternative should be approximately $12 per square foot of treatment.

Non-biodegradable reinforcement (turf reinforcement geotextile mats)
Non-biodegradable reinforcement includes turf reinforcement mats. These mats are typically a 3 dimensional plastic fabric that provides reinforcement to a soil/root mass matrix. The difference between the turf reinforcement mat and geogrid fabric is that the turf reinforcement mat has finer strands configured in a denser weave. Therefore, a non-woven coir fabric is not required to resist piping of fine soils. Turf reinforcement mats could be wrapped up the slope with an embedment length at the toe of slope or they could encapsulate soil lifts as in the vegetated geogrid or biodegradable reinforcement alternatives. Unvegetated turf reinforcement mats have withstood shear up to 2.25 psf in

laboratory flumes for 50 hours duration. Vegetated turf reinforcement mats have withstood shear up to 8.0 psf in laboratory flumes for 50 hours duration.

Turf reinforcement mats have less tensile strength than geogrid materials, and therefore are less apt to pull out from the streambank should a mature tree fall from the streambank. Thus, this alternative provides the benefits of a relatively high allowable shear during the vegetative establishment period and a high potential for providing shade and overhanging cover to the stream channel. Temporary irrigation may be required for this alternative, as described for the live stakes alternative. Typical costs associated with constructing non-biodegradable reinforcement are $13 per square foot of treatment.

Although it is widely agreed that hydraulic shear provides an appropriate measure of treatment methods' applicability, allowable shear values are often equivocal. In a recent paper Gerstgraser (1999) writes, "unfortunately, there are only few accurate and reliable values available to describe the resistance of soil bioengineering methods to hydrodynamic stress." Thus, in an attempt to provide a valid comparison of alternatives, table 5.1 compares short-term and long-term allowable shear values for each alternative, along with typical costs. These values are based on field experience and represent the thresholds that can be used as conservative design guidelines.

Table 5.1 Allowable shear and typical cost for bioengineered alternative bank protection

Alternative	Allowable shear		Typical cost $/sf
	Short-term	Long-term	
Live stakes (with coir fabric)	0.3 psf	Up to 6 psf	4
Brush mattresses	0.3 psf	Up to 6 psf	8
Vegetated geogrids	2.0 psf	Up to 6 psf	13
Biodegradable reinforcement	1.0 psf	Up to 6 psf	12
Non-biodegradable reinforcement	1.5 psf	Up to 6 psf	13

The estimated allowable shear table, above, shows similar long-term shear values for all alternatives. The anticipated performance of each alternative is differentiated by the short-term estimated allowable shear values. It is recommended that the short-term estimated allowable shear values be used for design criteria. The short-term estimated allowable shear design criteria may be used to determine how high up the streambank the riprap/bank treatment alternative interface will be placed. Thus, it is recommended that the bank treatment design discharge should be selected based upon the risk of exceeding the short-term estimated allowable shear at the riprap/bank treatment alternative interface.

Although, bio-engineered bank protection would be more beneficial to aquatic and terrestrial animals, they were eliminated from the St. Maries bank protection selection for several reasons. First, the estimated establishment period of 3-5 years would be inadequate provide immediate protection. Second, the expected shear stress occurring during a flood on St. Maries River would likely exceed the protection offered by the bio-engineered bank protection. Finally, the maintenance requirements of the bio-engineered alternatives would exceed the financial capabilities of the sponsor.

Selected bank protection alternative - Rock riprap with planting.
Joint planting or vegetative riprap planting involves using various techniques to establish vegetation growth in the joints or open spaces in the rock riprap. Roots improve drainage by removing soil moisture and over time bind or reinforce soil and prevent washout of fines between and below the rock. This alternative provides immediate riverbank protection, effective in reducing erosion on actively eroding banks, and dissipates some of the energy along the riverbank. For the best success of vegetation it is necessary to import topsoil to fill the voids between the rock prior to planting. The establishment of vegetation will provide shading, habitat for terrestrial invertebrates, and a detrital input of nutrients into the river for aquatic invertebrates. This alternative allows for the strength, durability, cost effectiveness and simplicity of design necessary for most bank revetment projects as well as providing improved habitat on the authorized project.

<u>(2) Floodwall replacement alternatives</u>
Alternative 1. Earthen levee alternative
This option would provide an earthen levee section in place of the existing wooden floodwall.

Alternative 2. Timber crib wall alternative.
This option would provide a new double-wall floodwall similar to the existing structure. Flood protection, benefits and annual costs would be the same as the sheet pile alternative.

Alternative 3. Expand existing advance measures repair
This option would add on to the existing H-pile shoring that was driven on the landside of the crib wall under PL 84-99 advance measures in February 1999. H-piles would be driven on the riverside and the wall would be shored up using steel walers and wire ropes.

Alternative 4. Concrete wall alternative
This option would provide a replacement floodwall in the existing footprint.

Preferred alternative - sheet pile wall with concrete cap alternative
Replacing the existing wooden floodwall with a driven sheet pile wall and concrete cap is the recommended option. The new floodwall would be built within the footprint of the existing structure. The wall would be built to the same level of flood protection as the rest of the existing flood control system.

5.05 Affected Environment

a. General

<u>(1) Drainage</u>

The St. Joe River originates on the western side of the bitterroot mountain range near the Idaho-Montana border. The St. Joe River drains an area of approximately 2,668 km^2 and flows in a westerly direction entering the southern end of lake Coeur d' Alene near St. Maries, Idaho. Mean annual discharge discharge for the St. Joe River near Calder is 2,339 cfs (USGS 1994). The upper river flows over rocky substrates through deep mountain gorges with alternating rapids and deep pools. Stream width and pool depth average 10.1 m and 2.0 m respectively, in the headwaters of the St. Joe River (Rankel 1971). In contrast, the lower river flows slowly through land with gentle topography characterized by lowland meadows. Stream widths and mid-channel depths in the lower river average 80.0 and 9.0 m, respectively. The St. Maries River is the largest tributary to the St. Joe River. Other tributaries of significance include Cherry, Thomas, Street, Rochat, Bond, Falls, Trout, Hugus, Moose, Mica, and Big creeks.

The lower 48.2 km of the St. Joe river have been largely converted from a riverine to lacustrine system from the construction of the post falls dam in 1906, and the resulting increased lake level elevation. As a result, water depth and velocity, as well as sediment transport capacity in this stretch of river has been altered. A secondary and relatively minor impact evident in the St. Joe River drainage is the presence of a road along the length of river from St. Maries upstream approximately 167 km (Rankel 1971). Miles of streambank were likely denuded for road construction but little channel alteration has occurred. Lack of habitat is the major factor limiting fish populations in the lower St. Joe River downstream from St. Joe City, and in the St. Maries River downstream from Lotus Crossing (Apperson et al. 1988). Instream cover and spawning habitat are generally absent in these areas. Logging occurs within the St. Joe River and has likely resulted in the introduction of fine sediment into this system.

Water quality issues in lower reaches of the St. Joe River include bank erosion, nutrient enrichment from point and non-point sources, excessive growth of aquatic plants, and bacterial contamination. Riverbank erosion is a primary water quality issue in the lower St. Joe River.

Ellis (1940) investigated the St. Joe River during a biological survey of the area. Ellis (1940) stated that "a good bottom fauna typical of the local stream conditions was found at all stations on the St. Joe River." The physical habitat conditions along the St. Joe river have changed since the time of Ellis's survey, but have not resulted in a significant impairment to the general health of the aquatic resources found within the drainage.

Davis (1961) and Calkin and Jones (1911) describe the drainage in detail. Sedimentary rock (Algonkin or pre-Cambrian) underlies the upper drainage. The upper river flows through forest covered mountains and steep narrow canyons and is characterized by long shallow riffles and deep pools. Quaternary sedimentary rock and glacial deposits form wide valleys and meadows in the lower drainage. The lower river has a wider channel, deeper pools, and shallower gradient than the upper river. Slackwater, formed by the Post Falls Dam, extends 67 miles up the St. Joe from Coeur d' Alene Lake with depths up to 60 feet. Bottom substrates range from bedrock, gravel, or coarse silt-sand in the upper river to a well-scoured clay and mulch bottom in the slackwater area (Falter 1969). The entire drainage drops in elevation from 7,649 feet at the headwaters to 2,214 feet at the confluence with Coeur d' Alene Lake.

Peak stream runoff occurs in May and June as a result of melting snowpack. Flows decrease throughout the summer and increase with the onset of fall-winter precipitation. The St. Joe river has more than 40 primary tributaries including the north fork of the St. Joe river that enters near Avery and the St. Maries river that enters at St. Maries, upstream of the project site.

<u>(2) Vegetation and wetlands</u>
The riverside bank is vegetated sparsely with many of the regional indigenous species. These species include snowberry, rose, alder, cottonwood, and willow. Some tall field grasses are also present, as are two or three unidentifiable early succession weeds.

<u>(3) Water quality</u>
The lower 48.2 km of the St. Joe river have been largely converted from a riverine to lacustrine system from the construction of the post falls dam in 1906, and the resulting increased lake level elevation. As a result, water depth and velocity, as well as sediment transport capacity in this stretch of river has been altered. A secondary and relatively minor impact evident in the St. Joe River drainage is the presence of a road along the length of river from St. Maries upstream approximately 167 km (Rankel 1971). Miles of streambank were likely denuded for road construction but little channel alteration has occurred. Lack of habitat is the major factor limiting fish populations in the lower St. Joe River downstream from St. Joe City, and in the St. Maries River downstream from Lotus Crossing (Apperson et al. 1988). Instream cover and spawning habitat are generally absent in these areas. Logging occurs within the St. Joe River drainage and has likely resulted in the introduction of fine sediment into this system.

Water quality issues in the lower reaches of the St. Joe River include bank erosion, nutrient enrichment from point and non-point sources, excessive growth of aquatic plants, and bacterial contamination. Riverbank erosion is a primary water quality issue in the lower St. Joe River. The designated beneficial uses for the lower reaches include primary and secondary contact recreation, agricultural water supply, and cold water biota. The water quality conditions measured in the lower rivers during the 1991-1993 lake study indicated these beneficial uses were fully supported by the St. Joe River.

<u>(4) Hazardous, Toxic and Radiological Waste (HTRW)</u>
There are timbers treated with creosote found within the project area that will need to be disposed of off-site. According to the Idaho Department of Environmental Quality, treated timbers (creosote and pentachlorophenol) are not hazardous wastes. These timbers may be placed in a municipal landfill, reused (such as for landscaping), or used as

fuel in an industrial furnace or boiler that has been "air-permitted" by EPA or local agencies to burn creosote-treated timbers.

No soil sampling is required to determine if it is hazardous. If waste characterization of the soil and timbers is required for disposal, collection of two wood core samples and two soil samples will be sufficient. The samples would be tested for semi-volatiles in a laboratory analysis.

b. Natural Resources

(1) Aquatic Resources

The St. Joe River was once considered one of the finest trout streams in America (Hunt 1952). Around the turn of the century (1901 to 1905), *The Courier*, the local newspaper of St. Maries, Idaho, frequently reported capture of 3.2 to 4.1 kg trout in the St. Joe River. Furthermore, it was reported that on some fishing trips anglers returned with as many as 50 to 100 "speckled trout" (presumable westslope cutthroat trout *Oncorhynchus clarki lewisi*) averaging 1.4 to 2.3 kg in a few hours.

Apperson et al. (1988) stated that the slackwater areas of the lower St. Joe River and St. Maries rivers do not support resident trout fisheries, primarily because of the absence of habitat and warm summer water temperatures. However, lower reaches of cooler tributaries to these systems have been used by adult trout during the summer. The slackwater reaches of both the St. Joe River and St. Maries River provide a short seasonal fishery for migratory trout. In 1987, the IDF&G employed gillnetting and electrofishing techniques to sample the fishery present in the slackwater portions of the St. Joe River and St. Maries River. No trout were collected with gill nets in either river system (Apperson et al. 1988). Other species that were captured in low numbers, included mountain whitefish (*Prosopium williamsoni*), yellow perch (*Perca flavescens*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxix nigromaculatus*), pumpkinseed (*Lepomis gibbosus*), tench (*Tinca tinca*), and sculpins (*Cottus spp*.). Electrofishing conducted in slackwater areas during the summer of 1987 provided additional species compositional information, with suckers (*Catostomus spp*.), northern pike minnow (*Ptychocheilus oregonensis*), yellow perch, and bullheads (*Ictalurus*) being dominant at 26%, 21%, 31%, and 16%, respectively of the total catch (Apperson et al. 1988). Species composition was generally similar to that obtained by gill netting. Species composition in the slackwater areas of the two rivers has not changed appreciably since 1948 when hoopnetting revealed that 99% of the fishery was comprised of tench, suckers, northern pikeminnows, brown bullheads (*Ictalurus nebulosus*), yellow perch, and sunfish (*Lepomis spp*) (Jeppson 1960).

As the primary gamefish in demand in the St. Joe River, cutthroat trout have been the focus of a substantial amount of research, including investigations into the abundance, distribution, and behavior of the species. Averett (1962) used growth and meristic differences to conclude that two geographically distinct races of cutthroat trout occur in the St. Joe River drainage; an adfluvial race found in the lower 1,389 km of the river, and a fluvial/resident race found in the upper tributaries. An abrupt change in elevation upstream of the town of Avery, may represent the geographic separation between two races (Averett 1962).

Most (78%) of the cutthroat trout harvest in the St. Joe River occurs during the interval extending from the late may to early June (Apperson et al. 1988). This exploitation is influenced by the movement of trout into and out of the upper river (Apperson et al. 1988). According to Averett (1962) adfluvial cutthroat trout in the St. Joe River spend at least one year in the stream environment before moving into the lake complex. Tag recoveries and earlier work (Thurow and Bjornn 1978) have indicated a distinct trend of cutthroat trout migration to the upper river (special regulation zone) during the spring to early summer, and downstream migration in the fall. Consequently, the general regulation area below the town of Avery serves as a migrations corridor. Utilization of this area by cutthroat trout is limited by over harvest, lack of habitat (including high water temperatures), and the migratory nature of this stock (Apperson et al. 1988).

Rankel (1971) investigated the upper and lower St. Joe River and concluded that populations of cutthroat trout were relatively small, that soon after fish entered the river from the tributaries they were harvested, and that angling caused a significant portion of the annual mortality. Rankel (1971) also concluded that the drainage was inadequately "seeded" with cutthroat trout fry and that few fish survived long enough to mature and spawn. Rankel (1971) felt that the St. Joe River cutthroat trout stocks were approaching biological extinction, and that over-fishing was primarily responsible for the decline in cutthroat stocks observed during the late 1960s. Bowler (1975) contended that overfishing coupled with habitat changes had seriously affected westslope cutthroat trout populations in the St. Joe River. However, other factors may play a role in determining the status of cutthroat populations. Rankel (1971) believed that hybridization had not contributed significantly to the decline in cutthroat stocks in the St. Joe River.

After several years of special regulations, Johnson and Bjornn (1978) concluded that special regulations had reversed the decline of cutthroat trout populations in the upper watershed, increasing abundance four-fold by 1975 (Horton and Mahan 1988). Snorkeling on the upper St. Joe River indicated good overall numbers of cutthroat trout including good numbers of large cutthroat trout in the red ives areas (Goodnight and Mauser 1978). Increased abundance, size, and catch rates for gamefish were observed in the St. Joe River following restrictive harvest regulations and tributary closures (Apperson et al. 1988; Bowler 1975).

During electrofishing surveys conducted in 1986 (Apperson et al. 1988), cutthroat trout were found in nearly all of the drainages surveyed. Other salmonids were found in most drainages, but the species composition was variable (Horton and Mahan 1988). The results indicated that populations were dominated by either cutthroat or brook trout (Apperson et al. 1988); rainbow trout were found in low abundance. Bull trout were found in four of the tributaries surveyed: Mica, Thomas, Trout, and Cherry Creeks (Apperson et al. 1988).

Snorkeling surveys indicated that overall trout densities ranged from 1.0 to 132.5 fish per $100m^2$ in tributaries to the St. Joe River (Apperson et al. 1988). Cutthroat or hybrid rainbow-cutthroat trout were observed in all but one of the tributaries snorkeled (Apperson et al. 1988), the highest densities of cutthroat trout were observed in streams that had been closed to fishing. Rainbow trout were observed in only one stream system, while brook trout were observed in all tributaries surveyed; bull trout were not observed during snorkeling surveys (Apperson et al. 1988). The lower St. Joe River tributaries have generally depressed densities of trout; Thurow and Bjornn (1978) reported a mean density of 8.3 age 1 and older cutthroat trout per 100 m^2 in the lower St. Joe River tributaries compared to an average of 12 per 100 m2 in the tributaries to the upper St. Joe River.

(2) Wildlife Resources

Since the project is located next to a heavy industrial area there is probably limited use by wildlife. It is likely to be used or inhabited by species that are typically associated with riparian habitats and have a high tolerance for human disturbance.

Ospreys (*Pandion haliaetus*), eagles (*Haliaeetus leucocephalus*), and red-tailed hawks (*Buteo jamaicensis*) are present in the general vicinity of the project area and may perch along some of the trees near the project. No perch trees are located within the project area. Furbearers, rodents, and other small mammals may be found on the riverside of the floodwall

(3) Endangered Species

A species request list was sent to USFWS on July 19, 1999. A response was received on august 24, 1999, (FWS reference 1-9-99-sp-406 file # 341.1000 found in appendix b). Listed and proposed endangered and threatened species which may occur within the vicinity of project included:

Threatened
Bald eagle (*Haliaeetus leucocephalus*)
Bull trout (S*alvelinus confluentus)*
Ute ladies'-tresses (S*piranthes diluvialis*)

Experimental nonessential
Gray wolf (C*anis lupus*)

There was no designated critical habitat, proposed species, or candidate species indicated to be present near the project site.

The gray wolf is a resident of northern Idaho. Populations of wolves in the western United States are in areas with the highest concentration of deer and elk. They have colonized parts of Montana, and have been periodically documented in Washington, Idaho, and Wyoming. Documentation of the presence of wolves has increased in Idaho since the 1970's, although no breeding or pack activity has been confirmed. Gray wolves occurring in Idaho south of I-90 are listed as nonessential experimental population, with special regulations defining their protection and management, as outlined in the final rules published in the federal register vol. 59, no. 224-november 22, 1994. These regulations include special provision regarding "take" of gray wolves. For section 7 interagency coordination purposes, wolves designated as nonessential experimental that are not within units of the National Park system or national wildlife refuge system are treated as proposed species. Federal agencies are required to confer with the US Fish and Wildlife Service (the service, USFWS) only when they determine that an action they authorize, fund, or carry out "is likely to jeopardize the continued existence" of the species.

Correspondence with the Idaho Department of Fish and Game indicated that there are no bald eagle nests or roosting sites located near the project site. However, St. Joe river basin is a known area for wintering bald eagles and it is highly likely that they may pass through the project area during foraging or migration. However, the project will be built during summer months when bald eagles are not present. Bull trout and Ute ladies'-tresses are both listed as threatened and may exist in the project area.

The St. Joe river drainage is considered to consist of one population of bull trout. A small number of bull trout use the river as a migratory corridor. In June 1995, the USFWS status review found listing bull trout as threatened or endangered was warranted under the endangered species act. In the same finding, the USFWS precluded listing the bull trout due to higher priority listing actions. After a court ordered reconsideration of the earlier finding, the USFWS issued a proposed rule to list in 1997 and issued the final rule to list the Columbia river bull trout population segment as threatened in June of 1998.

Ute ladies' tresses were listed as threatened by the USFWS on January 17, 1992. Historical range covered Colorado, Idaho, Montana, Nebraska, Nevada, Utah, Washington, and Wyoming. Currently it can be found in Colorado, Idaho, Montana, Utah, Washington, and Wyoming.

Westslope cutthroat trout are a species of concern that may be present in the project area. The US Fish and Wildlife Service has been petitioned to list the westslope cutthroat trout as threatened. Petitioned species receive no protection under the endangered species act. However, a petition is an early step in the listing process. The service has made a positive 90-day finding, published June 10, 1998, in the Federal Register (63FR 31691), that the petition presented substantial information that listing this species may be warranted. The service is now surveying the status of the species range-wide, preparatory to making a finding.

c. Cultural Resources

Seattle District archaeologist, David Grant, contacted the Idaho State Historic Preservation Office (ISHPO) on 1 May 2000 to initiate a record search for previously recorded historic properties and prior cultural resources work in or near the project area. Suzi Neitzel, Deputy State Historic Preservation Officer (Deputy SHPO), informed Grant on 8 June 2000 that there were no recorded historic properties in the project area. Prior archaeological reconnaissance work in the greater project area included a river survey completed in 1977 for the Idaho Panhandle National Forest and two surveys associated with work on the St. Joe River Road and Meadowhurst Road by the Idaho Transportation Department in 1997 and 1998.

Dr. David Rice, Seattle District Archaeologist, conducted the river survey in 1977 and recalls prehistoric cultural deposits and associated artifacts exposed during grading for a fertilizer plant less than one mile upstream and on the opposite shore from the project area (NE corner, Section 22, T46N, R2W). Rice recalls culturally sterile flood sediments capping the cultural materials to a depth of 40 to 60 cm.

d. Public Use and Recreation

St. Maries, located on the St. Joe River, offers many outdoor recreation opportunities. The St. Maries and St. Joe rivers combine to provide boating and fishing recreation. However, the project area is not considered a recreational area. Some fishing may occur on the waterward slope of the project. The project is located on Potlach property, which is not accessible to the general public.

e. Social and Economic

The flood plain under study encompasses about 195 acres on the left bank of the St. Joe river at the city of St. Maries, Idaho. There are 56 homes in the flood plain, 32 of which are mobile. The average value per house (structure only) is $53,000 for frame and $20,000 for mobile. Approximately 140 people reside in the flood plain, which also includes 17 commercial and industrial establishments, a city park and a US Forest Service building. Potlatch Corporation is by far the largest landowner in the flood plain. Its St. Maries manufacturing complex is the largest employer in Benewah county, employing 380 local residents. The total value of improvements and contents in the flood plain is estimated to be at least $53.0 million

5.06 Environmental Effects of the Alternatives

a. General

<u>(1) Drainage</u>

Alternative 1. Earthen levee alternative.

This alternative would not alter existing drainage patterns. Land use near the project site is primarily commercial. This alternative would not increase the amount of impermeable surface within the project site.

Alternative 2. Timber crib wall alternative.

This alternative would not alter existing drainage patterns. Land use near the project site is primarily commercial. This alternative would not increase the amount of impermeable surface within the project site.

Alternative 3. Expand existing advance measures repair.

This alternative would not alter existing drainage patterns. Land use near the project site is primarily commercial. This alternative would not increase the amount of impermeable surface within the project site.

Alternative 4. Concrete wall alternative.
This alternative would not alter existing drainage patterns. Land use near the project site is primarily commercial. This alternative would not increase the amount of impermeable surface within the project site.

Preferred alternative - sheet pile wall with concrete cap alternative.
This alternative would not alter existing drainage patterns. Land use near the project site is primarily commercial. This alternative would not increase the amount of impermeable surface within the project site.

<u>(2) Vegetation and Wetlands</u>
Alternative 1. Earthen levee alternative.
Removal of riparian vegetation is an unavoidable consequence of this project. Riparian area would be permanently lost in this alternative.

Alternative 2. Timber crib wall alternative.
Removal of some riparian vegetation is an unavoidable consequence of this project. Loss of riparian vegetation will be minimized to the maximum extent practicable. After construction, the riparian area will be planted with native vegetation. No wetlands will be impacted by this alternative.

Alternative 3. Expand existing advance measures repair.
No riparian vegetation would be removed as a result of this alternative. After construction, the riparian area will be planted with native vegetation. No wetlands are expected to be impacted by this alternative.

Alternative 4. Concrete wall alternative.
Removal of some riparian vegetation is an unavoidable consequence of this project. Loss of riparian vegetation will be minimized to the maximum extent practicable. After construction, the riparian area will be planted with native vegetation. No wetlands are expected to be impacted by this alternative.

Preferred alternative - sheet pile wall with concrete cap alternative.
Removal of some riparian vegetation is an unavoidable consequence of this project. Loss of riparian vegetation will be minimized to the maximum extent practicable. After construction, the riparian area will be planted with native vegetation. No wetlands are expected to be impacted by this alternative.

(3) Water Quality

Alternative 1. Earthen levee alternative

Water quality would not significantly impacted by this alternative. However, a temporary increase in turbidity may occur do to the construction techniques required by this alternative.

Alternative 2. Timber crib wall alternative

Since no in-water work would occur, no significant water quality impacts are expected to result from the proposed construction activities in this alternative.

Alternative 3. Expand existing advance measures repair

Since no in-water work would occur, no significant water quality impacts are expected to result from the proposed construction activities in this alternative.

Alternative 4. Concrete wall alternative

No significant water quality impacts are expected to result from this alternative.

Preferred alternative - sheet pile wall with concrete cap alternative

No significant water quality impacts are expected to result from the proposed construction activities. The following management actions would be implemented during construction activities. These conditions are included in project contracting specification documents; a Corps inspector would be on-site to ensure that contractors abide by these requirements.

1. Riparian and wetland areas will be avoided as staging or refueling areas.
2. Equipment will be stored, serviced, and fueled away from aquatic habitats or other sensitive areas.
3. The project will used clean material to minimize the release of fines into the aquatic environment.
4. Existing roadways or travel paths will be used for access to project sites.
5. Excavation and transport equipment machinery will be limited in capacity, but sufficiently sized to complete required activities.
6. All garbage will be removed from the project site and disposed of properly; undisturbed vegetated buffer zones will be retained along the project to the greatest extent possible to reduce sedimentation rates, channel instability, and aquatic habitat impacts.
7. Riprap will be limited to the extent absolutely needed and the use of bio-engineered techniques employed where possible.
8. The corps will stockpile native riparian vegetation removed during construction and replant it in the riparian corridor after construction of engineered features.
9. Will isolate the work area from the open water to prevent sediment delivery and turbidity in the river.

b. Natural Resources

(1) Aquatic Resources

Alternative 1. Earthen levee alternative.

This alternative is considered to have similar impacts to the aquatic resources as the recommend alternative. See recommend alternative for complete evaluation.

Alternative 2. Timber crib wall alternative.
This alternative is considered to have similar impacts to the aquatic resources as the recommend alternative. See recommend alternative for complete evaluation.

Alternative 3. Expand existing advance measures repair.
This alternative would not alter aquatic habitat, nor would it affect feeding, refuge or spawning habitat. No trees would be removed during construction. A small increase in turbidity and sedimentation could be expected to occur during a rain event. However, elevated turbidity levels would be negligible considering high background turbidity during such events and the materials would likely be flushed downstream.

Alternative 4. Concrete wall alternative.
This alternative is considered to have similar impacts to the aquatic resources as the recommend alternative. See recommend alternative for complete evaluation.

Preferred alternative - sheet pile wall with concrete cap alternative.
Potential impacts to aquatic resources were considered during the design of the proposed work, and steps have been taken to minimize construction impacts. Direct impacts to aquatic resources will be avoided by working during July and August (in the dry) and leaving as much as possible the existing vegetation. Also, plantings and large woody debris (LWD) will be incorporated into the bank protection design.

In the recommended alternative, bank protection will be required for 600 feet on the river side of the upstream end of the floodwall due to erosion of the slope. Bank stabilization structures and flow diversion structures alter a river's natural adjustment processes resulting in changes in channel morphology (Beschta and Platts 1986, Baker et al. 1988, Backiel and Penczak 1989, Surian 1999, Dister et al. 1990, Elser 1968). Thus, bank stabilization structures not only alter the banks they are designed to protect, but by redirecting a river's energy, change the morphology and physical structure of a river. Because bank stabilization structures restrain a river's natural lateral channel migration, they allow less large woody debris input, substrate deposition, and side-channel formation, and thereby lead to decreased habitat quality for fish. These changes in turn, would be expected to limit abundance and production of fish.

However, positive or neutral effects on fish resulting from bank stabilization with riprap have been observed in warmwater systems (Pennington et al. 1983a; Pennington et al. 1983b, Pennington et al. 1985, Farabee 1986, Hjort et al. 1984). And coldwater systems (Hunt 1988, Avery 1995, Binns 1994, Knudsen and Dilley 1987**,** Michny 1988, Lister et al. 1995). Overall, assessments of riprap in coldwater systems inhabited by salmonids tended to show deleterious effects. (Elser 1968, Knudsen and Dilley 1987, Thurow 1988, Beamer and Henderson 1998).

Overall literature that addresses the effects of bank stabilization with riprap on river biota provides ambiguous results when considered in aggregate. Some case studies showed higher diversities and abundances of fish and invertebrates along riprapped banks than natural banks. Other studies indicated decreases in abundances and diversities of fish along riprapped banks compared to natural banks. In some studies, benefits were accrued by some species while others were deleteriously affected.

Due to the fact that various enhancements can be incorporated into riprapped banks to benefit fish (Shields et al. 1995, Lister et al. 1995, US Fish and Wildlife Service 1992, Michny 1987, Kallemeyn and Novotny 1977, Hunter 1991; McClure 1991; Shields 1991). The Corps has designed rip rapped banks that incorporate woody vegetation provide more cover for fish and have a more natural appearance than rock riprap. Furthermore, Shields (1991) found that rip rapped banks on the Sacramento river, California, that incorporated woody vegetation suffered less damage from high flow velocities than unvegetated banks of the same age and similar curvature

In this project the pre-existing conditions are already degraded and no longer natural. Therefore, the effects of riprap and large woody debris may be viewed more realistically as partial mitigation of more severe past damage.

Best management practices (see water quality section 5.06 a.3) will be used to minimize turbidity releases into St. Joe River. However, during rainy weather there could be a release of sediment into the river. Suspended sediment produces little or no direct mortality on adult fish at levels observed in natural, relatively unpolluted streams.

It seems likely that fish have evolved behavioral or physiological adaptations to temporary high concentrations of suspended sediment in order to survive short-term conditions caused by natural spates and floods. Chronic high suspended sediment concentrations that are initiated by anthropogenic sources, however, may not be tolerated.

Despite early speculation about gill damage by suspended sediment (Cordone and Kelley 1961; Herbert and Merkens 1961), few reports indicated gill damage and impairment of respiratory function as a source of mortality (Mcleay et al. 1987; Redding et al. 1987; Reynolds et al. 1989). Whereas high suspended sediment concentrations may not be immediately fatal, thickening of the gill epithelium may cause some loss of respiratory function (Bell 1973).

One of the major sublethal effects of high suspended sediment is the loss of visual capability, leading to reduced feeding and depressed growth rate. Several researchers have reported decreased feeding and growth by fish in turbid conditions resulting from suspended sediment.

More is known about the effects of suspended sediment on macroinvertebrates. The most common direct effect observed in experiments with fine sediments has been a pronounced increase in downstream drifting. Such increased drift has been attributed primarily to a decrease in light with consequent drift responses similar to behavioral drift in a diel periodicity. Extraordinary drift under prolonged high levels of suspended sediment may deplete benthic invertebrate populations.

Severe damage to benthic invertebrate populations can be caused by heavy sediment deposits. The affected organisms consist mainly of the insect orders ephemeroptera, plecoptera, and trichoptera, (ept), which generally are the forms most readily available to foraging fish. Virtually no research has been conducted on the effect of sediment on the meiofauna of streambeds, despite increasing appreciation of the ecological importance of these small organisms to fisheries.

Any effect of sediment input to St. Joe River is likely to be of minor consequence since the biological effect of episodic inputs has been found generally to be temporary. Rapid recovery often results from invertebrate drift from upstream reaches. In an Ohio stream, sediments from eroding deposits of glacial lacustrine silt, although natural, simulated episodic events. The glacial silt periodically reduced benthic macroinvertebrates up to 5 km downstream from the site (Dewalt and Olive 1988). However, after one of the glacial silt deposits was completely eroded, sediment input ceased, the stream deposits cleared, and drift from upstream quickly restored benthic populations. In British Columbia, temporary siltation from a pipeline crossing reduced local benthos populations by up to 74% but benthos recovery was rapid after construction stopped (Tsui and Mccart 1981).

Also, because riprap provides many interstitial spaces and high amounts of surface area, aquatic invertebrates often flourish therein. Riprap in streams often becomes a location for sediment and debris deposition (Shields 1991), which enhances habitat for benthic invertebrates by providing additional food and cover (Burress et al. 1982; Mathis et al. 1982), except when the deposited sediments consist of sand (Sanders et al. 1986).

<u>(2) Wildlife Resources</u>
Alternative 1. Earthen levee alternative.
Wildlife will not be significantly impacted by this alternative. A few small mammals and small birds may temporarily lose a small amount of low quality habitat. Any improvements in vegetation will be of some benefit to wildlife.

Alternative 2. Timber crib wall alternative.
Wildlife will not be significantly impacted by this alternative. A few small mammals and small birds may temporarily lose a small amount of low quality habitat. Any improvements in vegetation will be of some benefit to wildlife.

Alternative 3. Expand existing advance measures repair
Wildlife will not be significantly impacted by this alternative. A few small mammals and small birds may temporarily lose a small amount of low quality habitat. Any improvements in vegetation will be of some benefit to wildlife.

Alternative 4. Concrete wall alternative.

Wildlife will not be significantly impacted by this alternative. A few small mammals and small birds may temporarily lose a small amount of low quality habitat. Any improvements in vegetation will be of some benefit to wildlife.

Preferred alternative - sheet pile wall with concrete cap alternative.
Wildlife will not be significantly impacted by this alternative. A few small mammals and small birds may temporarily lose a small amount of low quality habitat. Any improvements in vegetation will be of some benefit to wildlife.

(3) Endangered Species
Alternative 1. Earthen levee alternative.
In this alternative there would likely be minor to no effects for gray wolf, bald eagles, bull trout, and Ute ladies' tresses. This alternative would not result in a net loss or degradation of key gray wolf prey species or their habitats. This alternative would not result in the construction of any new roads or encourage new roads in gray wolf habitat. Project activities will not occur in the vicinity of a known den or a rendezvous site.

Correspondence with the Idaho Department of Fish and Game indicated that there are no bald eagle nests or roosting sites located near the project site. Best management practices will be used to avoid impact to various fish species that may serve as food for bald eagles. Impacts to bald eagle food or prey would be minimal as a result of this project. The project will be built during late summer/early fall when wintering bald eagles will not be present. However, this alternative will not fit in the footprint of the existing structure. Therefore the foot print would need to move riverward which may remove one to two trees that may be used as potential perch trees by bald eagles.

Best management construction techniques will reduce impacts to aquatic resources. No impact on bull trout food stocks, prey species or foraging areas will likely occur. There would be a small loss of established riparian vegetation in this alternative and a slight increase in sedimentation may occur. Minimal cover will be lost as a result of this alternative. The incorporation of large woody debris will provide a slight increase in instream habitat. Appropriate conservation measures will be employed to avoid direct effects to adult bull trout during construction. Also, the project will not significantly disrupt behavior patterns of migrating bull trout.

This alternative will not cause a disturbance or loss of habitat to Ute ladies' tresses. This species may be adversely affected by modifications of its habitat associated with livestock grazing, vegetation removal, excavation, construction, stream channelization, and other actions that alter hydrology. This project is not believed to cause any changes in hydrology to Ute ladies' tresses because the project consisted of simply reinforcing of an existing levee.

Alternative 2. Timber crib wall alternative.
In this alternative there would likely be minor to no effects for gray wolf, bald eagles, bull trout, and Ute ladies' tresses. This alternative would not result in a net loss or degradation

of key gray wolf prey species or their habitats. This alternative would not result in the construction of any new roads or encourage new roads in gray wolf habitat. Project activities will not occur in the vicinity of a known den or a rendezvous site.

Correspondence with the Idaho Department of Fish and Game indicated that there are no bald eagle nests or roosting sites located near the project site. Best management practices will be used to avoid impact to various fish species that may serve as food for bald eagles. Impacts to bald eagle food or prey would be minimal as a result of this project. The project will be built during late summer/early fall when wintering bald eagles will not be present. However, this alternative will not fit in the footprint of the existing structure. . This alternative may introduce contamination or pollution into the project area if the timbers in the structure need to be treated in order to prevent deterioration.

Best management construction techniques will reduce impacts to aquatic resources. No impact on bull trout food stocks, prey species or foraging areas will likely occur. This alternative will not increase the water temperature. There will be a minimal loss of established riparian vegetation. Also, an increase in sedimentation will not occur. Minimal cover will be lost as a result of this project. The incorporation of large woody debris will provide a slight increase in instream habitat. This alternative will not likely affect the upstream or downstream movement of bull trout, nor will it fragment bull trout habitat, reduce habitat patch size or isolate remaining subpopulations. No significant accumulations of sediment is anticipated. This alternative will not facilitate the introduction of non-native species, such as brook trout or brown trout (*Salmo trutta*), that may compete, hybridized with, or prey on bull trout. Also, this alternative will not significantly disrupt behavior patterns of migrating bull trout.

This alternative will not cause a disturbance or loss of habitat to Ute ladies' tresses. This species may be adversely affected by modifications of its habitat associated with livestock grazing, vegetation removal, excavation, construction, stream channelization, and other actions that alter hydrology.

Alternative 3. Expand existing advance measures repair.
In this alternative there would likely be minor to no effects for gray wolf, bald eagles, bull trout, and Ute ladies' tresses. This alternative would not result in a net loss or degradation of key gray wolf prey species or their habitats. This alternative would not result in the construction of any new roads or encourage new roads in gray wolf habitat. Project activities will not occur in the vicinity of a known den or a rendezvous site.

Correspondence with the Idaho Department of Fish and Game indicated that there are no bald eagle nests or roosting sites located near the project site. Best management practices will be used to avoid impact to various fish species that may serve as food for bald eagles. Impacts to bald eagle food or prey would be minimal as a result of this project. The project will be built during late summer/early fall when wintering bald eagles will not be present. However, this alternative will not fit in the footprint of the existing structure. .

This alternative may introduce contamination or pollution into the project area if the timbers in the structure need to be treated in order to prevent deterioration.

Best management construction techniques will reduce impacts to aquatic resources. No impact on bull trout food stocks, prey species or foraging areas will likely occur. This alternative will not increase the water temperature. There will be a minimal loss of established riparian vegetation. Also, an increase in sedimentation will not occur. Minimal cover will be lost as a result of this project. The incorporation of large woody debris will provide a slight increase in instream habitat. This alternative will not likely affect the upstream or downstream movement of bull trout, nor will it fragment bull trout habitat, reduce habitat patch size or isolate remaining subpopulations. No significant accumulations of sediment is anticipated. This alternative will not facilitate the introduction of non-native species, such as brook trout or brown trout, that may compete, hybridized with, or prey on bull trout. Also, this alternative will not significantly disrupt behavior patterns of migrating bull trout.

This alternative will not cause a disturbance or loss of habitat to Ute ladies' tresses. This species may be adversely affected by modifications of its habitat associated with livestock grazing, vegetation removal, excavation, construction, stream channelization, and other actions that alter hydrology.

Alternative 4. Concrete wall alternative.
In this alternative there would likely be minor to no effects for gray wolf, bald eagles, bull trout, and Ute ladies' tresses. This alternative would not result in a net loss or degradation of key gray wolf prey species or their habitats. This alternative would not result in the construction of any new roads or encourage new roads in gray wolf habitat. Project activities will not occur in the vicinity of a known den or a rendezvous site.

Correspondence with the Idaho Department of Fish and Game indicated that there are no bald eagle nests or roosting sites located near the project site. Best management practices will be used to avoid impact to various fish species that may serve as food for bald eagles. Impacts to bald eagle food or prey would be minimal as a result of this project. The project will be built during late summer/early fall when wintering bald eagles will not be present. However, this alternative will not fit in the footprint of the existing structure. . This alternative may introduce contamination or pollution into the project area if the timbers in the structure need to be treated in order to prevent deterioration.

Best management construction techniques will reduce impacts to aquatic resources. No impact on bull trout food stocks, prey species or foraging areas will likely occur. This alternative will not increase the water temperature. There will be a minimal loss of established riparian vegetation. Also, an increase in sedimentation will not occur. Minimal cover will be lost as a result of this project. The incorporation of large woody debris will provide a slight increase in instream habitat. This alternative will not likely affect the upstream or downstream movement of bull trout, nor will it fragment bull trout habitat, reduce habitat patch size or isolate remaining subpopulations. No significant accumulations of sediment is anticipated. This alternative will not facilitate the introduction of non-native species, such as brook trout or brown trout, that may compete, hybridized with, or prey on bull trout. Also, this alternative will not significantly disrupt behavior patterns of migrating bull trout.

This alternative will not cause a disturbance or loss of habitat to Ute ladies' tresses. This species may be adversely affected by modifications of its habitat associated with livestock grazing, vegetation removal, excavation, construction, stream channelization, and other actions that alter hydrology.

Preferred alternative - sheet pile wall with concrete cap alternative.
Under this alternative the project will not result in a net loss or degradation of key gray wolf prey species or their habitats. The project will not result in the construction of any new roads or encourage new roads in gray wolf habitat. Project activities will not occur in the vicinity of a known den or a rendezvous site.

Correspondence with the Idaho Department of Fish and Game indicated that there are no bald eagle nests or roosting sites located near the project site. However, St. Joe River basin is a known area for wintering bald eagles and it is highly likely that they may pass through the project area during foraging or migration.

Bald eagle food habits are extremely varied. Small prey are taken when abundant. However, larger fish, water birds, and small mammals are also taken as live prey. During winter, carrion such as carcasses discarded by trappers, winter-kill deer, and spawned-out salmon also attract eagles.

Migrant eagles begin to appear on traditional wintering grounds during late October. Peak numbers occur during January and February. The primary motivations during winter are feeding and conserving energy. Bald eagles congregate near sources of food, generally river, lakes, and the marine shoreline. When not actively feeding or searching for food, they will appear to "loaf" in favorite perch trees.

Best management practices will be used to avoid impact to various fish species that may serve as food for bald eagles. Migrating waterfowl may avoid the area of construction due to noise. Regardless, impacts to bald eagle food or prey would be minimal as a result of this project.

One of the two major threats to the bald eagle at present and for the foreseeable future is destruction and degradation of its habitat. This occurs through direct cutting of trees for shoreline development, human disturbance associated with recreational use of shorelines and waterways, and contamination of waterways from point and non-point sources of pollution. The project will not introduce any contamination or pollution into the project area.

The project will be built during late summer/early fall when wintering bald eagles will not be present. Therefore, direct impacts from construction are very unlikely.

Bull trout are opportunistic feeders with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993).

Adult migratory bull trout are primarily piscivorous, known to feed on various fish species (Fraley and Shepard 1989; Donald and Alger 1993). Bull trout evolved with, and in some areas, co-occur with native cutthroat trout (O*ncorhynchus clarki*), Resident (redband) and migratory rainbow trout (O*. mykiss*), chinook salmon (O*. tshawytscha*), sockeye salmon (*O. nerka*), mountain whitefish (P*rosopium williamsoni*), various sculpin (C*ottus spp.)*, sucker (Catastomidae) and minnow species (C*yprinidae)* (Rieman and McIntyre 1993).

Best management construction techniques will reduce impacts to aquatic resources. No impact on bull trout food stocks, prey species or foraging areas will likely occur. Although preferred water temperature varies by life history stage, consistently cold water is required at all critical life history stages for bull trout. Increases in stream temperatures can cause direct mortality, displacement by avoidance (Bonneau and Scarnechia 1996), or increased competition with species more tolerant of warm temperatures (Rieman and McIntyre 1993, Craig and Wissmar 1993). This project will not increase the water temperature. There will be a minimal loss of established riparian vegetation. Sedimentation can also increase water temperature of streams (i.e., By filling pools and reducing channel depth, increasing riffle area and channel width, which results in increased solar insulation [MBTSB 1998]). However, an increase in sedimentation will not occur.

Cover is an important component of habitat complexity that is used by bull trout at all life history stages. Cover can include woody debris, overhanging vegetation, undercut banks, cobble and boulder substrate, water depth and turbulence, and aquatic vegetation (Graham et al. 1981, Pratt 1984, Hoelscher and Bjornn 1989, Goetz 1991, Pratt 1992, Murphy 1995). Minimal cover will be lost as a result of this project. The incorporation of large woody debris will provide a slight increase in instream habitat.

This project will not likely affect the upstream or downstream movement of bull trout, nor will it fragment bull trout habitat, reduce habitat patch size or isolate remaining subpopulations. Appropriate conservation measures will be employed to avoid direct effects to adult bull trout during construction.

Bull trout show affinity for stream bottoms and a preference for deep pools of cold water streams, lakes, and reservoirs (Goetz 1989). Because of this strong association with the stream bottom throughout their life history they can be adversely affected by activities that directly or indirectly change substrate composition and stability. The Corps will isolate the work area from the open water to prevent sediment delivery and turbidity in the river. Therefore, no significant accumulations of sediment is anticipated.

The project is not within or above known or suspected bull trout spawning habitat. Most scientific literature suggests that the project area is unlikely to be used by bull trout for spawning, incubation, and juvenile rearing life history stages. Bull trout are among the most cold water adapted fish and require very cold water for incubation, juvenile rearing, and to initiate spawning. Juvenile rearing and spawning typically occur in the smaller tributaries and headwater streams that may be upstream of anadromous salmonids (Underwood et al. 1995, Reiman et al. 1997). There are no known areas of groundwater upwelling or influence in the project area that would be suitable for redd construction.

The project will not facilitate the introduction of non-native species, such as brook trout or brown trout, that may compete, hybridized with, or prey on bull trout. Also, the project will not significantly disrupt behavior patterns of migrating bull trout.
This project will not cause a disturbance or loss of habitat to Ute ladies' tresses. This species may be adversely affected by modifications of its habitat associated with livestock grazing, vegetation removal, excavation, construction, stream channelization, and other actions that alter hydrology. This project is not believed to cause any changes in hydrology to Ute ladies' tresses because the project consisted of simply reinforcing of an existing levee.

c. Cultural Resources

Effects on cultural resources are considered to be the same for all alternatives.

A phone conversation was held on June 8, 2000 between Ms. Neitzel of the Idaho State Historic Preservation Office (ISHPO) and David Grant of the US Army Corps of Engineers, Seattle District. They determined that a pre-construction site survey would not be productive because the earth filled crib wall is between the river and an asphalt road/parking surface and surface visibility is limited if not non-existent. Instead, the Deputy SHPO recommended that a site visit occur after the crib wall had been removed and the original grade exposed. In light of the flood sediment mantle observed by Dr. Rice and the highly disturbed nature of the area, both parties felt that it was unlikely the removal of the crib walls and interior fill would adversely affect buried cultural deposits. Nevertheless, ISHPO concurrence with Grant’s recommendations is contingent on the condition that the original ground surface be examined by a professional archaeologist after removal of the structure and prior to additional construction. Cultural resource monitoring of the placement of sheet pile is not recommended because it does not result in subsurface exposure.

Due to the disturbed nature of the levee surfaces and the lack of excavation into previously undisturbed surfaces, the likelihood of finding cultural resources is considered to be limited. However, if any cultural resources are encountered during construction, all work will cease and the State Historic Preservation Officer will be notified. If skeletal human remains are found in Idaho, local tribes (Coeur d'Alene Tribe) will be notified directly.

d. Public use and recreation

This project is an area that is not considered a recreational area or is open for public use. There will be a temporary and localized reduction in air quality due to emissions from equipment operating during dredging and disposal. Ambient noise levels will increase slightly while equipment is operating. These effects are regarded as insignificant. None of the alternatives would likely impact public use or recreation.

e. Social and economic

Alternative 1. Earthen levee alternative.

The social and economic effects of this alternative are considered to be the same as the recommended alternative.

Alternative 2. Timber crib wall alternative.

The social and economic effects of this alternative are considered to be the same as the recommended alternative.

Alternative 3. Expand existing advance measures repair

The social and economic effects of this alternative are considered to be the same as the recommended alternative.

Alternative 4. Concrete wall alternative

The social and economic effects of this alternative are considered to be the same as the recommended alternative.

Preferred alternative - sheet pile wall with concrete cap alternative

Construction activities will not adversely impact the economy of the area. Prime recreational destinations occur do not occur in the project area. This impact is not expected to prevent people from visiting St. Maries. The preferred alternative is expected to have a significant benefit for the local economy.

The relocation of the power lines has the potential disrupt the Potlatch plant’s production lines. Also, the floodwall replacement will also greatly disrupt the flow of traffic within the mill site. All truck traffic will have to be diverted around the complex site. The main employee parking lot will have to be relocated for the construction period. However, proper coordination between the local sponsor, the Corps, and Potlatch is being conducted to minimize any temporary impacts to the plant's production.

Without this project, the existing average annual flood damage between the zero damage point and the 200-year flood is $663,000. Under this alternative, if the proposed project (providing 200-year flood protection) was constructed and in operation, the estimated $663,000 in average annual damages will be prevented. Also, this alternative would contribute to overall community development by a reduction of the depressing economic effects of flood damages within the project area.

5.07 Cumulative Effects

Over 50 years of bank revetment and floodwall have most likely contributed to alterations of the natural flow regime which has resulted in numerous physical and biological changes to the river's ecosystem. Fish habitat has been affected through loss of bank gravel sources for spawning areas, channel narrowing, increase in scour and erosion in the channel (due to narrowing), reductions in channel migration and bank heterogeneity, decrease in habitat diversity, and removal of vegetative cover. However, incorporation of fish habitat structures and vegetation plantings will provide enhanced fish habitat over the existing fairly degraded condition. The proposed plan will not cause any new cumulative impacts, but the overall project has likely contributed adverse cumulative impacts to the river system.

5.08 Compliance with Environmental Requirements

a. Archeological and Historic Preservation Act, as amended
The corps has determined the project to be in full compliance.

b. Clean Air Act, as amended
The clean air act required states to develop plans, called state implementation plans (sip), for eliminating or reducing the severity and number of violations of national ambient air quality standards (NAAQS) while achieving expeditious attainment of the NAAQS. The act also required federal actions to conform to the appropriate sip. An action that conforms with a sip is defined as an action that will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

The Corps' determination is that emissions associated with this project will not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone).

c. Clean Water Act, as amended
A 404(b)`evaluation will be needed for the project actions. The US Army Corps of Engineers, Seattle District is in the process of completing a 404(b)1 evaluation (Appendix E) and will complete after a 30 day public notice.

Due to the fact that the project is on Coeur D' Alene Tribal reservation lands, a Clean Water Act Section 401 water quality certification will be required by the US Environmental Protection Service (EPA). This includes any work below the ordinary high water line, even if the work is being done during drawdown. Coordination is ongoing with EPA as well as the Idaho Department of Environmental Quality.

d. Coastal Zone Management Act of 1972, as amended

The coastal zone management act of 1972, as amended, requires federal agencies to carry out their activities in a manner which is consistent to the maximum extent practicable with the enforceable policies of the approved state coastal zone management program. The corps has determined that the coastal zone management act does not apply to the proposed project.

e. Endangered Species Act of 1973, as amended

In accordance with section 7(a)(2) of the endangered species act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed or proposed threatened or endangered species. Currently the US Army Corps of Engineers is undergoing informal consultation with the USFWS. A biological assessment has been prepared and sent to the USFWS by the Corps. Based on initial meetings it is expected that the USFWS will concur with the Corps determinations of not likely to adversely affect for bull trout and Ute ladies'-tresses. A concurrence of the determination of not likely to jeopardize the continued existence of gray wolf is also expected.

f. Estuary Protection Act

This law has been determined to be not applicable, as the project does not occur in an area regulated under this act.

g. Fish and Wildlife Coordination Act, as amended

The fish and wildlife coordination act (16 usc 470) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. The US Fish and Wildlife Service provided the Corps with a letter commenting on the draft feasibility report under authority of and in accordance with the fish and wildlife coordination act (48 stat, 401, as amended 16 u.s.c. 661 et seq.). This letter and the corps response are provided in appendix b. The US Fish and Wildlife Service will continue to consult throughout this project during the plans and specification phase.

h. Land and Water Conservation Fund Act of 1965, as amended

The corps has determined the project to be in full compliance.

i. National Environmental Policy Act of 1969, as amended

The environmental assessment incorporated within this report is in fulfillment of NEPA requirements. A draft environmental assessment for the project was prepared in June 2000. Copies were sent to the agencies listed in section 9. The public comment period on this draft EA was 30 days. The US Fish and Wildlife Service was the only entity to submit comments; these comments are addressed in Appendix B.

j. National Historic Preservation Act of 1966, as amended

The National Historic Preservation Act (16 USC 470) requires that the effects of proposed actions on sites, buildings, structures, or objects included or eligible for the

National Register of Historic Places must be identified and evaluated. A November 15, 1999 query of the 1993 Washington State Office of Archaeology and Historical Preservation database indicated that no sites listed on the National Register of Historic Places are located in the project section.

Idaho Deputy State Historic Preservation Officer (Deputy SHPO), informed the Corps that there were no recorded historic properties in the project area. The Corps has determined that no resources included or eligible for inclusion in the National Register of Historic Places would be effected by the proposed project.

k. Rivers and Harbors Act of 1899, as amended

Under section 10 of the rivers and harbors act, a project can not obstruct navigable water of the United States. The Corps has determined that the study is in full compliance. The proposed work would not obstruct navigable water of the United States.

l. Wild and Scenic River Act, as amended

The Corps has determined the project to be in full compliance. This project would not have any direct and adverse effect on the values for which a river was established as a designated component of the national wild and scenic river system.

m. Section 904 of the 1986 Water Resources Development Act

Section 904 of the 1986 water resources development act requires that the plan formulation and evaluation process consider both quantifiable and unquantifiable benefits and costs of the quality of the total environment, and preservation of cultural and historical values. This report and project are in full compliance.

n. Floodplain Management Plan.

In the 1996 Water Resources Development Act, congress added a new local cooperation agreement requirement for local sponsors of flood control projects. Within one year of signing the project cooperation agreement, the non-federal sponsor is required to prepare a floodplain management plan (fmp) for the project area. The sponsor must implement the plan within one year following the completion of project construction.

o. Section 307 of the 1990 Water Resources Development Act

Section 307 of the 1990 water resources development act establishes, as part of the water resources development program, an interim goal of no overall net loss of the nation's remaining wetlands, and a long-term goal of increasing the quality and quantity of the nation's wetlands. The recommended plan is in full compliance.

p. E.O. 11988, Floodplain Management

The study is in full compliance. The considered alternatives support avoidance of development in the flood plain, continue to reduce hazards and risks associated with floods and to minimize the impact of floods on human safety, health and welfare, and restores and preserves the natural and beneficial values of the base flood plain.

q. E.O. 11990, Protection of Wetlands
The project is in full compliance.

r. E.O.12898, Environmental Justice
Executive order 12898 requires the federal government to achieve environmental justice by identifying and addressing disproportionately high adverse effects of its activities on minority and low-income populations. It also requires the analysis of information such as the race, national origin, and income level for areas expected to be impacted by environmental actions. The project will not negatively affect low-income or minority populations. The work will protect existing roads, farmlands, and residential structures. It is not likely the proposed work will have a significant effect on Native American fishery rights or resources.

5.09 Irreversible and Irretrievable Commitments of Resources

No federal resources will be irreversibly and irretrievably committed to this project until the "finding of no significant impact" (FONSI) is signed.

5.10 Agency Coordination

Since November 1999, the study has been coordinated with federal, state, and county agencies, the local sponsor and the public. Coordination meetings have been held with representatives from the US Fish and Wildlife Service, Benewah County, Idaho Department of Environmental Quality and Idaho Department of Fish and Game. The result of the coordination with the key agencies indicated a desire to avoid impacts to bull trout and westslope cutthroat trout by working during July and august (in the dry) and leaving as much as possible the existing vegetation. Also, agencies requested that plantings and LWD be incorporated into the design.

A draft copy of this DPR/EA was distributed to St. Maries, Benewah County, Potlatch Corporation, Idaho Fish and Game, USFWS, Coeur D' Alene tribe, Idaho Department of Environmental Quality, EPA, Idaho Department of Lands, and the US. Army Corps of Engineers, Walla Walla District, in June 2000. Copies of the report were placed at the St. Maries public library and city hall for public review. Comments were received from the US Fish and Wildlife Service and the Potlatch corporation. Comments and responses are included in appendix B.

5.11 References

Apperson, K.A., M. Mahan, W. D. Horton. 1988. North Idaho Streams Fishery Research River and Stream Investigations. Job Completion Report, Project No. F-73-R-10.

Averett, R. C. 1962. Studies of two races of cutthroat trout in Northern Idaho. IDF&G Job Completion Report F-47-R-1.

Avery, E. L. 1995. Effects of streambank riprapping on physical features and brown trout standing stocks in Millville Creek. Wisconsin Department of Natural Resources Research Report 167.

Backiel, T., and T. Penczak. 1989. The fish and fisheries in the Vistula River and its tributary, the Pilica River. Pages 488-503 *in* D. P. Dodge, editor. Proceedings of the International Large River Symposium (LARS). Canadian Special Publication of Fisheries and Aquatic Sciences 106, Department of Fisheries and Oceans, Ottawa.

Baker, J. A., R. L. Kasul, L. E. Winfield, C. R. Bingham, C. H. Pennington, and R. E. Coleman. 1988a. An ecological investigation of revetted and natural bank habitats in the lower Mississippi River. Report 9, Lower Mississippi River Environmental Program, U.S. Army Corps of Engineers, Mississippi River Commission, Vicksburg, Mississippi.

Beamer, E. M., and R. A. Henderson. 1998. Juvenile salmonid use of natural and hydromodified stream bank habitat in the mainstem Skagit River, northwest Washington. Skagit System Cooperative, LaConner, Washington.

Bell, M.C. 1973. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers, Fisheries Engineering Research Program, Portland, Oregon.

Beschta, R. L., and W. S. Platts. 1986. Morphological features of small streams: significance and function. Water Resources Bulletin 22:369-379.

Binns, N. A. 1994. Long-term responses of trout and macrohabitats to habitat management in a Wyoming headwater stream. North American Journal of Fisheries Management 14:87-98.

Boag, T.D. 1987. Food habits of bull charr, *Salvelinus confluentus*, and rainbow trout, *Salmo gairdneri*, coexisting in a foothills stream in northern Alberta, Canada, Can. Field-Nat. 101: 56-62.

Bonneau, J.L. and D.L. Scarnechia. 1996. Distribution of juvenile bull trout in a thermal gradient of a plunge pool in Granite Creek, Idaho. Transactions of the American Fisheries Society 125:628-630.

Bowler, B. 1975. Coeur d' Alene Lake fisheries investigations. Idaho Department of Fish and Game, Lake and Reservoir Investigations, Job Performance Report, Project No. F-53-R-10. 16p.

Burress, R. M., D. A. Krieger, and C. H. Pennington. 1982. Aquatic biota of bank stabilization structures on the Missouri River, North Dakota. Technical Report No. E-82-6. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Cordone, A. J., and D.W. Kelly. 1961. The influences of inorganic sediment on the aquatic life in streams. California Fish and Game 47:189-228.

Craig, S.D., and R.C. Wissmar. 1993. Habitat conditions influencing a remnant bull trout spawning population, Gold Creek, Washington. Draft Report. Fisheries Research Institute, University of Washington.

DeWalt, R.E., and J.H. Olive. 1988. Effects of eroding glacial silt on the benthic insects of Silver Creek, Portage County, Ohio. Ohio Journal of Science 88:154-159.

Dister, E., D. Gomer, P. Obrdlik, P. Petermann, and E. Schneider. 1990. Water management and ecological perspectives of the upper Rhine's floodplains. Regulated Rivers: Research and Management 5:1-15.

Donald, D. B. and D.J. Alger. 1993. Geographic distribution, species displacement, and niche overlap for lake trout and bull trout in mountain lakes. Canadian Journal of Zoology. 71: 238-247

Ellis, M.M. 1940. Pollution of the Coeur d' Alene River and adjacent waters by mine wastes. Report to U.S. Bur. of Fisheries. 61p.

Elser, A. A. 1968. Fish population of a trout stream in relation to major habitat zones and channel alterations. Transactions of the American Fisheries Society 97:389-397.

Farabee, G. B. 1986. Fish species associated with revetted and natural main channel border habitats in Pool 24 of the upper Missouri River. North American Journal of Fisheries Management 6:504-508.

Fraley, J.J. & B. B. Shepard. 1989. Life History, ecology, and population status of migratory bull trout (*Salvelinus confluentus*) in the Flathead Lake and River System, Montana, Northwest Science 63: 133-143.

Goetz, F. 1991. Bull trout life history and habitat study. Final Report to the Deschutes National Forest. Contract No. 43-04GG-9-1371. Deschutes National Forest, Bend, Oregon.

Goodnight, W.H. and G.R. Mauser. 1978. Federal Aid to Fish and Wildlife Restoration. Job Performance Report, Project No. F-71-R-2.

Herbert, D.W.M., and J.C. Merkens. 1961. The effect of suspended mineral solids on the survival of trout. International Journal of Air and Water Pollution 5:46-55.

Hjort, R. C., P. L. Hulett, L. D. LaBolle, and H. W. Li. 1984. Fish and invertebrates of revetments and other habitats in the Willamette River, Oregon. Technical Report E-84-9, U.S. Army Engineer Waterway Experiment Station, Vicksburg, Mississippi.

Hoelscher, B., and T.C. Bjorn. 1989. Habitat, density and potential production of trout and char in Pend Oreille Lake tributaries. Project F-71-R-10, Subproject III, Job No. 8. Idaho Department of Fish and Game, Boise, ID.

Horton, W.D. and M.F. Mahan. 1988. Idaho Fish and Game. Federal Aid in Fish Restoration. Job Performance Report, Project F-73-R-9.

Hunt, R. L. 1988. A compendium of 45 trout stream habitat development evaluations in Wisconsin during 1953-1985. Wisconsin Department of Natural Resources Technical Bulletin 162.

Hunter, C. J. 1991. Better trout habitat–a guide to stream restoration and management. Island Press, Washington, D.C.

Johnson, T. H., and T. C. Bjornn. 1978. The St. Joe River and Kelly Creek cutthroat trout populations: an example of wild trout management in Idaho. Pages 39-47 in J.R. Moring, editor. Proceedings of the wild trout-catchable trout symposium. Oregon Department of Fish and Wildlife, Portland.

Kallemeyn, L. W. and J. F. Novotny. 1977. Fish and food organisms in various habitats of the Missouri River in South Dakota, Nebraska, and Iowa. FWS/OBS-77.25, U.S. Fish and Wildlife Service, National Stream Alteration Team, Columbia, MO.

Knudsen, E., and S. J. Dilley. 1987. Effects of riprap bank reinforcement on juvenile salmonids in four western Washington streams. North American Journal of Fisheries Management 7:351-356.

Lister, D. B., R. J. Benniston, R. Kellerhals, and M. Miles. 1995. Rock size affects juvenile salmonid use of streambank riprap. Pages 621-632 *in* C. R. Thorne, S. R. Abt, B. J. Barends, S. T. Maynord, and K. W. Pilarczyk, editors. River, and Coastal and Shoreline Protection: Erosion Control Using Riprap and Armourstone. John Wiley & Sons, New York.

Mathis, D. B., C. R. Bingham, and L. G. Sanders. 1982. Assessment of implanted substrate samples for macroinvertebrates inhabiting stone dikes of the lower Mississippi River. Miscellaneous Paper E-82-1, U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Mississippi.

MBTSG (Montana Bull Trout Scientific Group). 1998. The relationship between land management activities and habitat requirements of bull trout. Report prepared for the Montana Bull Trout Restoration Team, Helena, Montana.

McClure, W. V. 1991. Initial effects of streambank stabilization on a small trout stream. M.S. thesis, Montana State University, Bozeman.

McLeay, D.J., I.K. Birtwell, G. F. Hartman, and G. L. Ennis. 1987. Responses of Artic grayling (Thymallus arcticus) to acute and prolonged exposure to Yukon placer mining sediment. Canadian Journal of Fisheries and Aquatic Sciences 44:658-673.

Michny, F. 1988. Concluding report, evaluation of palisade bank stabilization, Woodson Bridge, Sacramento River, California. U.S. Fish and Wildlife Service, Division of Ecological Services, Sacramento, California.

Murphy, M.L. 1995. Forestry impacts on freshwater habitat of anadromous salmonids in the Pacific Northwest and Alaska-Requirements for protection and restoration. U.S. Dep. of Commerce, Coastal Ocean Program, Decision Analysis Series No. 7, 156 p.

Pennington, C. H., J. A. Baker, and C. L. Bond. 1983a. Fishes of selected aquatic habitats on the Mississippi River. Technical Report E-83-2, U.S. Army Engineer Waterways Experiment Station, CE, Vicksburg, Mississippi.

Pennington, C. H., J. A. Baker, and M. E. Potter. 1983b. Fish populations along natural and revetted banks on the lower Mississippi River. North American Journal of Fisheries Management 3:204-211.

Pennington, C. H., S. S. Knight, and M. P. Farrell. 1985. Responses of fishes to revetment placement. Arkansas Academy of Science Proceedings 39:95-97.

Pratt, K.L. 1984. Pend Oreille trout and char life history study. Idaho Department of Fish and Game, Boise, Idaho.

Pratt, K.L. 1992. A review of bull trout life history. Pages 5-9 in Howell, P.J. and D. V. Buchanan, editors. Proceedings of the Grearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Rankel, G. 1971. St. Joe River Cutthroat and Northern Squawfish Studies. Idaho Department of Fish and Game.

Redding, J. M., C. B. Schreck, and F. H. Everest. 1987. Physiological effects on coho salmon and steelhead of exposure to suspended solids. Transactions of the American Fisheries Society 116:737-744.

Rieman, B.E. and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. USDA Forest Service, Intermountain Research Station. General Technical Report INT-302

Reynolds, J.B., R. C. Simmons, and A. R. Burkholder. 1989. Effects of placer mining discharge on health and food of Arctic grayling. Water Resources Bulletin 25:625-635.

Sanders, L. G., C. R. Bingham, and D. C. Beckett. 1986. Macroinvertebrate gear evaluation. Miscellaneous Paper E-86-3, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Shields, D. F. 1991. Woody vegetation and riprap stability along the Sacramento River Mile 84.5–119. Water Resources Bulletin 27:527-536.

Shields, F. D., Jr., C. M. Cooper, and S. Testa. 1995. Towards greener riprap: environmental considerations from microscale to macroscale. Pages 557-574 *in* C. R. Thorne, S. R. Abt, B. J. Barends, S. T. Maynord, and K. W. Pilarczyk, editors. River, Coastal and Shoreline Protection: Erosion Control Using Riprap and Armourstone. John Wiley & Sons, New York.

Surian, N. 1999. Channel changes due to river regulation: the case of the Piave Piver, Italy. Earth Surface Processes and Landforms 24:1135-1151.

Thurow, R. F., and T.C. Bjornn. 1978. Response of cutthroat trout to cessation of fishing in St. Joe River tributaries. Bullentin No. 25. College of Forestry, Wildlife and Range Science. University of Idaho, Moscow, Idaho. USA.

Thurow, R. F. 1988. Effects of stream alterations on rainbow trout in the Big Wood River, Idaho. Pages 175-188 *in* S. Wolfe, editor. Proceedings of the 68th Conference of the Western Association of Fish and Wildlife Agencies, Albuquerque, New Mexico.

Tsui, P.T.P., and P.J. McCart. 1981. Effects of stream-crossing by a pipeline on the benthic macroinvertebrate communities of a small mountain stream. Hydrobiologia 79:271-276.

U.S. Fish and Wildlife Service. 1992. Juvenile salmon study, Butte Basin reach, Sacramento River bank protection project. Final Report to U.S. Army Corps of Engineers, Sacramento, California.

USGS. 1994. Water Resources Data - Idaho. Volume 2. U.S. Geological Survey. Boise, Idaho

SECTION 6. COST ESTIMATE AND SCHEDULE

6.01 Project Cost Estimate

A summary cost estimate is shown in Appendix F. The MCASES cost estimate can be found in Appendix F- Government Cost Estimate. Construction costs reflect October 2001 price levels. A cost contingency of 15% for construction costs and 15% for design and administrative costs was used in the estimate. The fully funded cost estimate is based on a construction midpoint of October 2001. Of the $1,149,000 project cost ($1,186,000 fully funded), 65% would be the Federal share (currently estimated at $770,900). The non-Federal sponsor's share is derived as follows: The sponsor is required to fund the costs of the lands, easements, rights-of-way, relocations and disposal areas, or LERRD (estimated to be $7,000), pay 5% of the total project cost in cash, and provide sufficient additional cash to bring the non-Federal sponsor's share to 35% of the total project cost. The total non-Federal sponsor's share is estimated to be $415,100.

6.02 Operation and Maintenance

The non-Federal sponsor will be responsible for the operation and maintenance (O&M) following completion of the project in accordance with an O&M manual to be prepared by Seattle District. In general, O&M standards include the following:

Maintain the floodwall and make all necessary repairs, replacements and rehabilitation; and

Correct any damage to the floodwall resulting from pedestrians, vandalism, and/or vehicles.

An annual inspection of the project will be conducted by both the Corps of Engineers and the non-Federal sponsor. Any deficiencies discovered will be the non-Federal sponsor's responsibility to correct. Annual O&M costs resulting from the project are estimated to be $5,000.

6.03 Design and Construction Schedule

The schedule for the design and construction of the project beginning with the distribution of the report for public review is listed below. This schedule is based on Federal and sponsor funds being available when needed.

DPR and EA distributed for public and agency review	15 June 2000
Final public review comments received	21 July 2000
Independent technical review begins	4 December 2000
Technical review completed; comment resolution	28 February 2001
DPR and EA submitted for approval to Division Office	17 April 2001

Seattle District receives authority to initiate Plans and Specifications (P&S)	1 May 2001
P&S substantially complete; Seattle District requests approval for construction and PCA execution	1 July 2001
Seattle District receives approval for construction and PCA execution	10 July 2001
PCA signed by Corps and city of St. Maries	12 July 2001
Contracting procedures begin	15 July
Notice to Proceed	1 August 2001
Construction begins	15 August 2001
Construction complete	30 September 2001
Floodplain Management Plan complete	30 March 2002

SECTION 7. ECONOMIC EVALUATION

7.01 Purpose and Scope

This section presents procedures and methodologies used to evaluate the socioeconomic effects of the proposed flood damage reduction project at St. Maries, Idaho. Economic studies undertaken as part of this report included studies enumerating and evaluating damages related to the existing economic development in the flood plain, sensitivity evaluations and optimization scenarios evaluating the benefits and costs of alternative project scopes. The outcome of these evaluations combined with engineering, environmental, and local sponsor considerations have led to the selection of the recommended plan.

7.02 Location and Description

The flood plain under study encompasses about 195 acres on the left bank of the St. Joe River at the city of St. Maries, Idaho. There are 56 homes in the flood plain, 32 of which are mobile. The average value per house (structure only) is $53,000 for frame and $20,000 for mobile. Approximately 140 people reside in the flood plain, which also includes 17 commercial and industrial establishments, a city park and a U.S. Forest Service shop building. Potlatch Corporation is by far the largest landowner in the flood plain. Its St. Maries manufacturing complex is the largest employer in Benewah County, employing 380 local residents. The total value of improvements and contents in the flood plain is estimated to be at least $53.0 million

7.03 Existing Flood Protection

Existing flood protection in the study area consists of a Corps constructed floodwall adjacent to the Potlatch property and upstream and downstream Federal levees that tie into the floodwall. In its deteriorated condition, the failure event for the floodwall was determined to correspond to a river stage of 2138.2 feet (at AVISTA gage), which is about a 13-year event. A geotechnical analysis of the adjacent earthen levees determined their probable failure point (PFP) at 2145.0 (250-year event) and the probable non-failure point (PNP) at 2144.0 (200-year event). Reconstruction of the floodwall to its previous authorized height would therefore restore 200-year protection to the flood plain.

7.04 Historical Floods

There has been no flooding in the study area since the completion of the Federal project in May of 1942. The floodwall and levees protected the city against the February 1996 flood that was slightly less than the 100-year flood peak on both the St. Maries and St. Joe Rivers. This was the flood of record on the St. Maries River (near Santa-gage) and was only exceeded by December 1933 flood on the St. Joe River (at Calder-gage). Local residents have reported that prior to completion of the Federal project, the flood plain was completely inundated on several occasions.

Based on input from a structural and geotechnical analysis, it was determined that the deteriorated floodwall would be expected to fail when the St. Joe River reached a stage that would result in water heights of 4 feet or greater against the structure. This equates to a stage of 2138.2 feet at the AVISTA gage (2138.0 at floodwall), which is about a 13-year event.

7.05 Survey and Types of Flood Damages

Flood damage surveys were conducted in March of 1999 and February 2000, and were updated to reflect October 2000 prices and conditions for the flood plain area described in paragraph 7.02. Field surveys determined flood plain use, occupancy, and evaluation of structures subject to damage. Local contacts, including public officials, residents, and owners and employees of commercial and industrial firms were used extensively to obtain first hand information concerning the extent of potential flooding. Knowledgeable persons employed in local real estate sales and appraising were interviewed to obtain present market value of structures and contents. Monetary losses were only considered for physical damages caused by inundation and increased living expenses for families displaced by flooding. Total damages were estimated for river stages associated with the hypothetical 13-year, 20-year, 50-year, 100-year, and 200-year floods. These events, in conjunction with the point of zero damage, were used to establish a stage-damage relationship for the project. Tangible damages were determined under October 2000 prices and conditions for the following categories or types of flood losses:

a. Residential

Residential damages included inundation losses to structures and contents. Residential values were determined using Benewah County Assessors' records, local real estate agents, and recent sales data. Average content value was estimated to be 50 percent of the structure value. Structure value of single-family residences ranged from $38,000 to $77,000, with an average value of $53,300. Mobile homes were considered separately. Depth-damage relationships were determined with the aid of Federal Insurance Administration damage tables that show damages as a percent of value and as a function of water depth relative to the first floor. Flood losses include damage to foundations, floors, walls, heating equipment, furniture, appliances, and personal property.

b. Industrial/Commercial

Industrial and commercial damages included inundation losses to all properties used in manufacturing, commerce, business, wholesale and retail trade and, services. Physical damages to industrial and commercial property and facilities included damages to buildings, equipment, supplies, inventory, and other items used to conduct business. Structure and content damages were assessed using depth-damage functions developed in past Corps studies or from personal interviews. Loss of wages to employees and income losses sustained by firms were not considered in this analysis.

c. Potlatch Corporation

Potlatch Corporations' St. Maries Complex was included as a separate category due to the magnitude of their flood damages. The Potlatch mill complex is located on the downstream end of the flood plain and employs about 380 people. This facility includes a sawmill, a planer mill, a plywood plant, maintenance shops and storage sheds, an office building, and 60 to 70 acres of log storage. Log, plywood, and lumber inventory is valued at about $13 million. The flood damages include physical damage to buildings, equipment, inventory, finished products, and the additional costs for cleanup.

d. Public Facilities

Public damages included inundation losses to a city park and a U.S. Forest Service shop facility. Utility damages such as losses to electric, water, gas, and telephone lines and damages to city streets were not estimated for this study.

7.06 Existing Average Annual Damages- Without Project Condition

The point of zero damage for the study area was determined from a structural/geotechnical analysis of the deteriorated floodwall. A hydraulic analysis of over bank flooding was not done for this study; therefore flood plain water depths that corresponded to the five hypothetical floods used in the economic analysis were based on river stages and flood plain topography observed in the field. Damages for each category of damage were prepared for stages associated with these hypothetical floods. A stage-frequency relationship developed for the St. Joe River at the St. Maries floodwall was used in this analysis. Details of this derivation are shown in Appendix A, Hydrologic and Hydraulic Design. Average annual damages were derived for the study area using the Corps of Engineers Hydrologic Engineering Center’s computer program “Expected Annual Flood Damage Computation”. This program integrates exceedance frequency with associated damages to determine annual damages for a given frequency interval. Table 7.1 shows frequency-to-damage and stage-to-damage relationships and average annual damages under without project (existing) conditions for flood events between the 10 percent (10-year flood) and the 0.5 percent (200-year flood) exceedance frequency. Damages start to occur at the floodwall failure event, a 12.5 year flood or 8 percent exceedance frequency.

Table 7.1
Damage Probability Relationship
October 2000 Prices and Conditions- $1,000

PROB(%)	STAGE	RESIDENTIAL	COMM/IND	PUBLIC	POTLATCH	TOTAL
10.00	2137.50	0	0	0	0	0
8.00	2138.00	0	35.0	4.0	1742.0	1781.0
5.00	2138.80	155.0	73.0	9.0	4817.0	5054.0
2.00	2140.40	277.0	275.0	16.0	9635.0	10203.0
1.00	2141.70	593.0	735.0	26.0	15374.0	16728.0
0.50	2143.50	779.0	1427.0	36.0	18893.0	21135.0
Expected Annual Damage		19.8	23.7	1.1	618.4	663.0

7.07 Future Average Annual Damages- Without Project Condition

No significant changes are expected in average annual damages (other than increases associated with general inflation), under the without project condition. The commercial/industrial area of the flood plain is fully developed with well-established firms. A few vacant lots remain in the residential area, but local officials have indicated that this area is unlikely to attracted new single family residential construction. Three new mobile homes, however, have recently been placed on fill in the residential area, but they appear to be well above the 100-year flood level.

7.08 Existing Average Annual Damages- With Project Condition

As shown in table 7.1, existing average annual flood damages between the zero damage point and the 200-year flood are $663,000. If the proposed project (providing 200-year flood protection) was constructed and in operation in October 2000, the estimated $663,000 in average annual damages would have been prevented, and are therefore taken as project benefits. Table 7.2 summarizes existing average annual damages (benefits) by category at October 2000 price levels for the selected plan.

Table 7.2
Expected Average Annual Benefits
With Proposed Project
St. Maries Study Area
(October 2000 Prices and Conditions)

Category	Damages Prevented
Residential	$19,800
Industrial/Commercial	23,700
Potlatch Corp.	618,400
Public	1,100
TOTAL	$663,000

7.09 Remaining Flood Damages

Remaining flood damages include residual damages and induced damages. Residual damages are those that would continue to be incurred even with the proposed project in operation. Consideration was also given to the possibility that the project could induce new sources of damage. This could happen if settlement of hazardous areas was encouraged or if flood stages or velocities were increased.

a. Residual Damages
The entire flood hazard area under study would be provided 200-year protection from St Joe River flooding by the proposed project. Damages from all floodflows exceeding the 200-year level of protection would be significant however. Hydrologic, hydraulic, and economic analyses of floods exceeding the 200-year event were not accomplished for this study, but damages associated with flooding exceeding the level of protection, assuming no catastrophic failure of the floodwall or upstream or downstream levees, are estimated to be at least $3.0 million, and likely range up to $8.0 to $10.0 million for very large events. If failure of the floodwall or levees were to occur under with-project conditions, it is likely that residual damages would mirror those shown in Table 7.1 for the 200-year event.

b. Induced Damage
Induced flood damages are not anticipated as a result of the proposed project. No new development is expected in the flood plain as a direct result of the project, and induced flooding in adjacent areas will not occur as the new floodwall is designed to the same height as the existing wall that has been in place for over 50 years.

7.10 Project Justification

The cost estimate for the first cost associated with the proposed project can be found in Appendix F- Government Cost Estimate. Estimates of annual charges were based on a 50-year period of analysis or economic life. Interest during construction has been included in the total investment cost and was computed on a compound basis over a 2-month period. Interest and amortization charges were based on a 6-5/8 percent interest rate. Estimated annual operation and maintenance costs were also included. Table 7.3 presents a summary of annual benefits and costs under existing conditions.

Table 7.3
Benefit-Cost Comparison
(Benefits at October 2000 Prices and Conditions
Costs Fully Funded at October 2001 Prices)
6 5/8 Percent Interest

Total Estimated Construction Cost	$ 1,149,000
Interest During Construction	37,000
Total Investment Cost	$ 1,186,000
Average Annual Costs:	
Interest and Amortization	$ 71,700
Operation and Maintenance	5,000
Total	$ 76,700
Average Annual Benefits	$ 663,000
Benefit-to-Cost Ratio	8.6 to 1.0

7.11 Project Maximization

Maximizing net tangible benefits is an economic evaluation concept used to determine that scope of project, or investment, where the last increment of cost is equal to the incremental benefit. The recommended level of protection of a project is thus determined by picking that alternative with the largest net NED benefits.

The level of protection provided by the proposed floodwall project, however, was determined by the upstream and downstream levees that tie into the structure. A geotechnical analysis determined the probable non-failure point for these levees at 2144 feet, which corresponds to a 200-year flood event. The floodwall was therefore sized to accommodate a 200-year flood. Consideration was given to providing higher levels of protection by increasing the height of the adjacent levees along with a higher floodwall. Rebuilding the levees to a higher elevation would require a much larger footprint, requiring costly real estate acquisitions, and producing significant adverse impacts to several commercial/industrial firms that form the backbone of the local community's economic base. Due the significant cost increases, and the adverse impact property acquisitions would cause to several large commercial and industrial firms, there is no local support for increasing the level of protection beyond the 200-year flood. Therefore, a floodwall providing 200-year protection is the only implementable plan, and a true maximization study was not performed. All of the alternatives investigated provide the same benefits. A quick look at the incremental costs associated with raising the levees (and floodwall) to provide protection greater than the 200-year event, also indicates that they exceeded the incremental benefits; thus the proposed project appears to also be the NED plan.

7.12 Risk and Uncertainty

A full-blown probabilistic risk and uncertainty evaluation as outlined in ER1105-2-101 was not accomplished for this study. Risk and uncertainty issues were not, however, totally ignored in the analysis. The hydrology analysis incorporated uncertainty in the derivation of stage-frequency relationships and uncertainty in flood stage were evaluated in hydraulic studies (see Appendix A-Hydrologic and Hydraulic Design). Project justification was not sensitive to key economic variables such as residential structure value and first floor elevation as all residential structure and content benefits could be eliminated and the proposed project would still be well justified.

SECTION 8. NON-FEDERAL RESPONSIBILITIES

8.01 Cost Sharing and the Project Cooperation Agreement

As required by WRDA 1986, the non-Federal sponsor is required to contribute 35 percent of the total project implementation costs. This includes the plans and specifications phase and the construction phase. The sponsor is also required to provide all necessary real estate, but the cost of the real estate (known as the LERRD value) is counted as part of the sponsor's 35 percent share.

Once the plans and specifications phase has been completed and the potential project is approved for construction, the sponsor and the Seattle District of the Corps of Engineers would be required to sign a document called the Project Cooperation Agreement (PCA) before construction could begin. This agreement spells out the responsibilities of the sponsor and the Corps for the construction and maintenance of the project. The document contains 19 articles and covers such topics as definitions and general provisions, obligations of the government and sponsor, land and relocation regulations, credit for land, the project coordination team, method of payment, dispute resolution, operation and maintenance, and several other topics. The sponsor has reviewed a draft of the PCA and has agreed to enter into the agreement prior to project construction. Signing of the PCA would be dependent upon successful completion of the feasibility and plans and specifications phases.

The project costs and non-Federal sponsor cost share will be re-assessed once plans and specifications are completed prior to executing the PCA. A final determination of non-Federal contributions will be conducted during final accounting following project construction.

8.02 Sponsor's Financial Plan

The City of St. Maries, the non-Federal sponsor, is willing and able to share the costs of project implementation. As shown in Section 6.01, the fully funded cost estimate, which assumes a project construction midpoint of October 2001, is $1,186,000. The city's share of this estimated cost is $415,100 (35%). With credit received for required project real estate ($7,000), the City's remaining estimated cash contribution is $408,100. Assuming a construction start in August 2001, these funds would be required by July 2001. The City's Statement of Financial Capability and Financing Plan was provided by letter dated 18 January 2001, and is included in Appendix B.

8.03 Assessment of Sponsor's Capability

The Corps' assessment of the local sponsor's financial capability is required to verify that sufficient funds will be available to the sponsor to satisfy the financial obligations for the project. The financing plan submitted by the City of St. Maries is satisfactory and sufficient. The plan described below was based on an initial fully funded cost of $1,069,000 and a local sponsor cost of $374,000. The final cost estimate is $1,186,000 fully funded and a local sponsor cost of $415,100. The additional $41,100 will be provided by Benewah County.

The city intends to fund its $366,000 cost share from the following sources:

1.	Benewah County Levee Improvement Fund.	$160,000
2.	Form a Local Improvement District (LID) in the area protected by the floodwall.	$150,000
3.	The City Timber Fund.	$ 56,000
	TOTAL	**$366,000**

The Benewah County Levee Improvement Fund are in-hand County dollars that are earmarked for flood control projects. The money originated from the Idaho Department of Commerce. The City and County are currently working on an agreement to grant the city $160,000 from that fund, for the floodwall. The City is also in the process of forming a LID in the area protected by the floodwall. Assessments collected from this LID is expected to provide another $150,000 of the required funds. The remaining $56,000 needed for the project will come from the City's Timber Fund, over which the city has total discretionary use. The city's letter of 18 January 2001 is included in Appendix B.

An allocation of funds table is not included as construction will only require 3 months. All sponsor funds would be required by July 2001.

SECTION 9. COORDINATION

9.01 Coordination With Key Agencies

a. General

Since November 1999, the study has been coordinated with federal, state, and county agencies, the local sponsor and the public. The result of the coordination with the key agencies indicated a desire to avoid impacts to bull trout and westslope cutthroat trout by working during July and August (in the dry) and leaving as much as possible the existing vegetation. Also, agencies requested that plantings and LWD will be incorporated into the design. See Appendix B- Coordination for documentation of coordination activities.

b. U.S. Fish and Wildlife Service

The Fish and Wildlife Coordination Act (FWCA) requires that the report of the FWS shall be made an integral part of the U.S. Army Corps of Engineers report and that the project plan shall include such justifiable means and measures for fish and wildlife protection as the Corps finds should be adopted to obtain maximum overall project benefits. This coordination is continuing.

c. Idaho State Agencies

As part of the developing this project, Idaho Department of Fish and Game, Idaho Department of Environmental Quality, and Idaho Department of Lands have been involved since the onset of this project. Meetings have been held with the IDFG and IDEQ and all three agencies will be sent drafts of the project report and their comments and concerns will be addressed in the final draft of the report.

d. Local Government

Coordination with the local sponsor and Benewah County has been ongoing throughout the planning of this project.

9.02 Coordination of Draft Report (Including Environmental Assessment)

a. Review of Draft Report

A draft copy of this DPR/EA was distributed to St. Maries, Benewah County, Potlatch Corporation, Idaho Fish and Game, USFWS, Coeur d' Alene Tribe, Idaho Department of Environmental Quality, EPA, Idaho Department of Lands, and the U.S. Army Corps of Engineers, Walla Walla District, in June 2000. Copies of the report were placed at the St. Maries public Library and City Hall for public review. Comments were received from the U.S. Fish and Wildlife Service and the Potlatch Corporation. Comments and responses are included in Appendix B.

b. Public Meeting

The City of St. Maries elected not to have a public meeting.

SECTION 10. CONCLUSIONS AND RECOMMENDATIONS

10.01 Conclusions

This study has included an examination of all known practical structural and non-structural alternatives for meeting the study objective of reducing flood damage potential at St. Maries Idaho. The plan is consistent with national policy, statutes and administrative directives. The plan has been reviewed in light of overall public interest, which includes the views of the local sponsor and interested agencies. I have concluded that the city of St. Maries is capable of meeting its financial responsibilities and that the total public interest would be served by implementation of the recommended plan.

10.02 Recommendations

I recommend the proposed work be authorized and a Federal funding allotment of $770,900 (fully funded) be made available to complete construction. The proposed work would replace the aging timber floodwall that is currently the weak point in the existing flood control system at St. Maries, Idaho, as is generally described in this report, with such modifications by the Chief of Engineers as may be advisable to meet provisions of Section 205 of the 1948 Flood Control Act, as amended. Authorization is subject to cost sharing and financing arrangements with the non-Federal sponsor, the city of St. Maries, and is based on the cost sharing and financing requirements as contain in Public Law 99-662 (November 1986), as modified by Public Law 104-303 (October 1996). Prior to construction, during the Plans and Specifications stage, the local sponsor will be required to sign the project's Project Cooperation Agreement with the Department of the Army.

Mona King
Chief, Planning Branch
Seattle District, Corps of Engineers